PB82-266156

Distribution and Abundance of Waterfowl and Submerged Aquatic Vegetation in Chesapeake Bay

(U.S.) Fish and Wildlife Service
Laurel, MD

Prepared for

Environmental Protection Agency
Philadelphia, PA

Sep 82

U.S. Department of Commerce
National Technical Information Service
NTIS

PB82-266156

EPA 600/3-82-082
September 1982

DISTRIBUTION AND ABUNDANCE OF WATERFOWL AND SUBMERGED AQUATIC VEGETATION IN CHESAPEAKE BAY

by

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Interagency Agreement Number EPA-78-D-X0391

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OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO.
EPA 600/3-82-082

2.

3. RECIPIENT'S ACCESSION NO.
PB82 266156

4. TITLE AND SUBTITLE
Distribution & Abundance of Waterfowl and Submerged Aquatic Vegetation in the Chesapeake Bay

5. REPORT DATE
September 1982

6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)
Robert E. Munro and Matthew C. Perry

8. PERFORMING ORGANIZATION REPORT NO.
CBP-TR-001S

9. PERFORMING ORGANIZATION NAME AND ADDRESS
U. S. Fish & Wildlife Service, Migratory Bird and Habitat Research Laboratory, Laurel, Maryland 20811

10. PROGRAM ELEMENT NO.
2BA703

11. CONTRACT/GRANT NO.
EPA 78-D-X0391

12. SPONSORING AGENCY NAME AND ADDRESS
Region III, U. S. Environmental Protection Agency
Chesapeake Bay Program,2083 West Street
Annapolis, Maryland 21401

13. TYPE OF REPORT AND PERIOD COVERED
Project Report 8/1/78-12/31/80

14. SPONSORING AGENCY CODE

submerged aquatic vegetation

15. SUPPLEMENTARY NOTES

and

and

16. ABSTRACT
Waterfowl species populations in Maryland & Virginia portions of Chesapeake Bay were examined during long-term and current (1972-1980) periods to identify trends in distribution and abundance. Comparisons were also made between State and Atlantic Flyway populations & waterfowl species distributions among survey areas. Distribution & abundance of SAV among waterfowl survey areas in Md. were summarized for 7 plant species during 9 years (1971-1979). These data (SAV species combined) were used to test the hypothesis that annual variation in area populations of waterfowl was related to variation in the abundance of SAV, following an adjustment for annual variation in the general abundance of waterfowl.The distribution and abundance of SAV species declined in Md. waters during the 1970's. There were few statistically significant relationships between distribution and abundance of waterfowl and SAV. But there was an implied biological relationship, since the most important waterfowl wintering areas were also among the most abundantly vegetated areas. This report was submitted in partial fulfillment of Interagency Agreement No. EPA-78-D-X0391 by the U. S. Fish and Wildlife Service, Migratory Bird and Habitat Research Laboratory under the sponsorship of the Chesapeake Bay Program, U. S. Environmental Protection Agency.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group

18. DISTRIBUTION STATEMENT
Unrestricted distribution

19. SECURITY CLASS *(This Report)*
Unclassified

20. SECURITY CLASS *(This page)*
Unclassified

21. NO. OF PAGES
193

22. PRICE

EPA Form 2220-1 (9-73)

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ABSTRACT

Waterfowl species populations in Maryland and Virginia portions of Chesapeake Bay were examined during long-term and current (1972-80) periods to identify trends in distribution and abundance. Comparisons were also made between State and Atlantic Flyway populations, and waterfowl species distributions among survey areas.

Distribution and abundance of submerged aquatic vegetation (SAV) among waterfowl survey areas in Maryland were summarized for seven plant species during nine years (1971-79). These data (SAV species combined) were used to test the hypothesis that annual variation in area populations of waterfowl was related to variation in the abundance of SAV, following an adjustment for annual variation in the general abundance of waterfowl.

Waterfowl food habits were summarized and analyzed when possible. These data provided additional evidence on relationships between waterfowl and SAV, and indications of changing food preferences within some species.

Recent Maryland waterfowl populations (with one exception) generally declined, while those in Virginia increased or remained stable. Species dispersion among areas was typically stable. The most important waterfowl wintering areas in Chesapeake Bay have been and continue to be the Chester River, Eastern Bay, and the lower Choptank River.

The distribution and abundance of all SAV species declined in Maryland waters during the 1970's. During that period, SAV was most abundant in areas that included the lower Choptank River, Manokin and Annemessex Rivers, Chester River, and Eastern Bay.

There were few statistically significant relationships between distribution and abundance of waterfowl and SAV. But there was an implied biological relationship, since the most important waterfowl wintering areas were also among the most abundantly vegetated areas.

Waterfowl species adapted differently to the decline of SAV during the 1970's. Whistling swans began feeding in agricultural fields, while others shifted food preferences from SAV to invertebrates. However, the most common adaptation was to winter elsewhere in the Atlantic Flyway. Due to the northern location of Chesapeake Bay, through which many waterfowl annually migrate, current populations of some species are believed to be temporarily low. When exposed to increased distribution and abundance of submerged aquatic vegetation, we anticipate that waterfowl species with preferences for SAV and associated invertebrates will respond positively.

This report was submitted in partial fulfillment of Interagency Agreement No. EPA-78-D-X0391 by the U.S. Fish and Wildlife Service, Migratory Bird and Habitat Research Laboratory under the sponsorship of the Chesapeake Bay Program of the U.S. Environmental Protection Agency. This report covers the period August 1, 1978, to December 31,1980, and work was completed as of February 15, 1981.

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ACKNOWLEDGMENTS

We are indebted to B. K. Williams (primary responsibility), P. H. Geissler, L. M. Moyer, and E. D. Heinlein for statistical consultation. We also thank V. G. Perros, L. D. Eastman, C. J. Ellis, P. Longabucco, P. L. Miller, and J. M. Wilcox for technical assistance. Many people assisted in food habits analyses used in this report and their input is appreciated. Of special importance were C. K. Rawls for his work during the 1960's, and F. M. Uhler whose contributions have spanned decades.

V. D. Stotts (Maryland Wildlife Administration) offered advice and expertise on Maryland waterfowl populations, as well as access to original data from periodic surveys of submerged aquatic vegetation. To the many pilots and biologists who participated in surveys of waterfowl or vegetation in Chesapeake Bay, we express our gratitude. H. F. Percival and B. S. Brun provided valuable administrative expertise. We are finally indebted to G. M. Haramis, C. F. Kimball, and J. D. Nichols for their critical review of this report.

EXECUTIVE SUMMARY

The Chesapeake Bay is the largest estuarine system along the Atlantic coast of North America, and the most important wintering area in the Atlantic Flyway for more than 1.5 million waterfowl (including ducks, geese, and swans). Historically (1956-), the Maryland portion of the Bay has been the principal Flyway wintering area for Canada geese (*Branta canadensis*), whistling swans (*Cygnus columbianus columbianus*), and canvasbacks (*Aythya valisineria*), and a primary wintering area for ruddy ducks (*Oxyura jamaicensis*), common goldeneyes (*Bucephala clangula americana*), redheads (*A. americana*), black ducks (*Anas rubripes*), and mallards (*A. platyrhynchos*). In addition to wintering other populations, the Bay provides a resting and feeding place for countless birds that migrate to and from wintering areas farther south. The Bay is therefore vital as a wintering area and as a link in a chain of resting areas.

The traditional importance of Chesapeake Bay to waterfowl was due in large measure to vast beds of submerged aquatic vegetation, which included species such as widgeongrass (*Ruppia maritima*), wildcelery (*Vallisneria americana*), and sago pondweed (*Potamogeton pectinatus*). But during the 1970's those waterfowl food resources declined, which in large measure prompted this work. The main objectives of this report are to document historic and current distribution, abundance, and food preferences of waterfowl that winter in Chesapeake Bay, and examine current relationships between waterfowl and the distribution and abundance of SAV.

Linear regression and analysis of variance techniques were used to detect trends in distribution and abundance of waterfowl species populations that winter in Maryland and Virginia, and to examine waterfowl-SAV relationships with simple, linear models. Waterfowl food habits were analyzed where possible with a ranking procedure, which compared historic and current usage of important food items.

Maryland and Virginia waterfowl populations differed considerably in species diversity and numbers of birds. The smaller Virginia populations were also more stable than those in Maryland. However, distributions of species populations among survey areas in both States were very consistent over years.

Distribution and abundance of SAV in Maryland waters declined during the 1970's, and particularly from 1971 to 1973. Of the seven SAV species considered, all declined; however, widgeongrass remained relatively abundant and widely distributed. SAV was most abundant in the lower Choptank River, Manokin and Annemessex Rivers area, Chester River, and Eastern Bay during the 1971-79 period.

The common response by waterfowl species with known preferences for SAV (e.g., redheads, American wigeon [*Anas americana*], and pintails [*A. acuta*]) was to winter elsewhere in the Atlantic Flyway during the 1970's. Others (whistling swans and canvasbacks) changed food preferences. The wintering Canada goose population in Maryland, which now requires only open water for protection and agricultural fields for food, continued a long-term increase in numbers.

The distribution (dispersion) and abundance of waterfowl populations among Maryland survey areas generally reflected the distribution and abundance of SAV, although few statistically significant relationships were found. The areas most important to wintering waterfowl (Chester River, Eastern Bay, and the lower Choptank River) prior to and during the 1970's were also among the most abundantly vegetated areas during the 1970's. It follows from this general relationship that waterfowl populations have had no adverse or long-term impact on distribution and abundance of submerged aquatic vegetation.

The currently low diversity of waterfowl species wintering in Maryland is believed to be temporary, and limited by the distribution and abundance of SAV. Since formerly abundant species of waterfowl still migrate annually through the Bay area, a positive and rapid response to an improvement in distribution and abundance of submerged aquatic vegetation may be anticipated.

SECTION 1

INTRODUCTION

Chesapeake Bay, the largest estuarine system in North America, contains a diverse collection of many plant and animal communities. Waterfowl (Anatidae) are among the most prominent animals during fall and winter. Of 45 species of ducks, geese, and swans that are native to North America (Bellrose 1976), about 30 regularly migrate through or winter in the Bay area (Stewart 1962). Although a few species such as the black duck (*Anas rubripes*) and the mallard (*A. platyrhynchos*) breed in Bay marshes, most waterfowl are present in the area only from October through March. The use and importance of Chesapeake Bay to waterfowl are therefore greatest during this period.

Historically, the Bay has been the most important wintering area along the Atlantic coast for a number of waterfowl species, such as the whistling swan (*Cygnus columbianus columbianus*), Canada goose (*Branta canadensis*), and the canvasback (*Aythya valisineria*). Other populations have been far less abundant. Early migrants such as blue-winged teal (*Anas discors*) spend little time in the Bay before departing in mid-October for wintering areas in South America. Some winter residents, due to their habitat preferences, are not obvious to the casual observer. For example, the sea ducks or scoters (*Melanitta spp.*), as their colloquial names imply, occupy deep (>3 m), open-water habitats generally beyond the littoral zone. Others, such as the Atlantic brant (*Branta bernicla hrota*), are usually found only in ocean bay habitats (e.g., Sinepuxent Bay, Maryland).

Ducks are often referred to as either surface-feeding or puddle ducks, as opposed to diving or bay ducks. Puddle ducks feed by dabbling at the water's surface or tipping up in shallow water, even though they are capable of diving beneath the water's surface. They typically prefer shallow marshes and shoal riverine habitats, and as a group they consume more plant material than do diving ducks. The diving ducks all share two physical characteristics that facilitate diving, their primary method of feeding: their wings are relatively small and their legs are set farther back on their body. As a consequence, divers need open water across which to run prior to flight, which prevents them from feeding in dense marshes or agricultural fields. Diving ducks are usually found in exposed, deeper waters (1-5 m), where vegetation is less available.

Submerged aquatic vegetation (SAV) is an important food resource for many waterfowl species (Cottam 1939; Martin and Uhler 1951; Yocom 1951; Stewart 1962; Bellrose 1976). In his account of the canvasback, Bent (1923:195) reported ". . . it [wildcelery (Vallisneria americana)] grows most abundantly in the Chesapeake Bay region and is supposed to be the chief attraction for the vast number of canvasbacks and other ducks which resort to these waters in winter . . .". The traditional importance of the Bay to many waterfowl populations provides indirect evidence of a long-term stability in the Bay's aquatic plant and animal food resources. But waterfowl populations and the food resources upon which they depend are not stable in the short-term. There have been changes in waterfowl distribution and abundance in the Bay during the last 25 years, as well as more recent changes in distribution and abundance of SAV. The purpose of this study is to examine relationships between waterfowl and SAV resources of the Bay.

Specific objectives include an examination of 1) waterfowl food habits in the Bay area, 2) distribution and abundance of SAV, 3) wintering waterfowl populations, 4) relationships between waterfowl and the distribution and abundance of SAV, and 5) impacts of waterfowl on SAV.

SECTION 2

CONCLUSIONS

Historically, Maryland waterfowl populations were more diverse in species and more numerous than those in Virginia, where populations were generally more stable. Distributions (dispersions) of species populations among survey areas in both States were remarkably stable. The most important wintering areas for waterfowl in Chesapeake Bay are the Chester River, Eastern Bay, and the lower Choptank River.

Significant changes occurred in the Bay's submerged aquatic plant resources during the 1970's. SAV abundance declined considerably from 1971 to 1973, and fluctuated thereafter. Of the seven plants examined, widgeongrass (*Ruppia maritima*) was the most widely distributed (number of areas) and abundant (highest frequency occurrence) species of SAV in Maryland. However, all species declined during the 1971-79 period. SAV in Maryland was most abundant in the lower Choptank River, Manokin and Annemessex Rivers area, Chester River, and Eastern Bay.

Species of waterfowl adapted differently to these conditions. Increased numbers of whistling swans began feeding in agricultural fields during the early 1970's, even though this behavior was well established 10-15 years earlier on their northward migrations. Responses among ducks were affected by physical differences between the two general categories examined. Puddle or dabbling ducks, which normally feed by tipping up in shallow water, are capable of feeding in agricultural fields and dense marsh habitats. Diving or bay ducks have evolved relatively shorter wings and other physical characteristics that facilitate swimming beneath the water's surface where they typically feed. These birds, essentially incapable of feeding on land, could change their food preferences only within the estuarine environment. Of course, both puddle and diving ducks could winter elsewhere within or outside of the Bay area.

Maryland populations of the four puddle duck species examined were considerably less abundant during the 1970's when compared to long-term levels. Pintail (Anas acuta) and American wigeon (A. americana) populations, which have known preferences for SAV, are now essentially absent from Maryland wintering areas. Black duck and mallard populations, which showed relationships to the distribution and abundance of SAV, also decreased. The current level of Maryland puddle duck populations, as a group, is about one-third of the former level.

Among diving ducks, canvasbacks and redheads (Aythya americana) were most affected by the recent decline in SAV. Although species of SAV were principal food items of canvasbacks prior to the 1970's, they were essentially the only foods of redheads. Canvasback food preferences completely changed during the 1970's to a diet that consisted mainly of Baltic macoma clams (Macoma balthica) and other invertebrates. Also during that period, Maryland wintered a decreasing percentage of the Atlantic Flyway canvasback population. Although significant changes in the Flyway distribution of redheads occurred prior to the 1970's, the most important difference was a consistently low number of these birds throughout the 1970's. The redhead population in Maryland is now only a remnant of past populations.

On the positive side, the Canada goose population in Maryland continued to expand. These birds began foraging on land during the mid-1950's when the mechanization of agriculture increased the availability of waste (unharvested) cereal grains. This population averaged about

265,000 geese between 1956 and 1971, although it increased at a rate of 23,000 birds/year. During recent years Maryland wintered more than 500,000 Canada geese. The future of this population rests in agricultural fields.

Waterfowl populations have had no long-term impact on distribution and abundance of SAV. Prior to the 1970's, waterfowl populations were greatest in areas such as Chester River, Eastern Bay, and the lower Choptank River. During the 1970's, SAV was most abundant in these areas despite a history of use by abundant waterfowl populations.

The relatively low diversity of waterfowl species currently wintering in Maryland, although mitigated somewhat by tremendous populations of Canada geese, is cause for concern. However, the outlook is optimistic due in large measure to the northern location of Chesapeake Bay with respect to other important wintering areas. Major population segments of most Flyway species annually stop in the Bay area while on migration to and from wintering areas farther south. These populations are therefore exposed to Bay conditions on an annual basis. We anticipate they would soon respond positively to an improvement in distribution and abundance of submerged aquatic vegetation.

SECTION 3

MATERIALS AND METHODS

SOURCES AND LIMITATIONS OF DATA

Waterfowl Food Habits

Food habits of Chesapeake Bay waterfowl were summarized by Stewart (1962). His original data, collected mostly during the 1950's, were obtained and supplemented with additional samples for some species. Although methods and specific areas of collection were identifiable for most samples, these potentially important sources of variation were disregarded to increase sample sizes and provide a Bay-wide description of food items used by waterfowl. Other sources of variation, such as the organ from which foods were obtained and identified (Swanson and Bartonek 1970), temporal or long-term changes (Perry and Uhler 1976), and differences between species (Stewart 1962) were included.

Stewart (1962:2) determined the total volume of food contents for an organ sample by volumetric displacement, and then visually estimated the proportion of each food item. Samples from other collections differed only in that volumes for each food item were separately measured, or that organ (source) was not recorded. Scientific and common names of Bay waterfowl food items are shown in Appendix Table A-1.

Various measures have been used to describe the food habits of animals (e.g., Martin et al. 1946; Korschgen 1969; Swanson et al. 1974). The latter authors demonstrated that the aggregate percent method was favored over the aggregate volume method. Briefly, if we have J food items and I birds, the aggregate percentage is the proportion of the jth food item in the ith bird averaged over all samples. This procedure gives equal weight to each bird in the sample, and is not affected by variation in individual sample volumes (Swanson et al. 1974:303); this is particularly appropriate here since most samples were opportunistically obtained. In addition to aggregate percentages, we also determined the frequency occurrence of each food item in the sample.

Since we have no measures of availability for many food items used by Bay waterfowl, we must exercise caution when discussing preference, selection, or importance. We are consequently limited in the questions or hypotheses we may examine with these data. Johnson (1980) discussed these problems and proposed a procedure for comparing ranks of usage and availability measurements. Johnson's method basically compares two multivariate normal vectors of means (ranks), and is sufficiently general for our purposes. Here we are interested in the hypothesis of no difference between two samples in utilization of important food items. Our application of Johnson's method therefore compares two levels of usage rather than usage and availability.

In a preliminary series of analyses we were interested in whether or not samples of food items identified in two different organs were sufficiently similar to allow combination. In practice, we identified a small list (i.e., the number of items was small compared to available sample sizes) of items that were important (frequently utilized) in samples from organ A. We then determined the rank of each food item on the list with respect to the other listed items for each individual in both organ samples A and B. Mean ranks of usage for each food item within each category (organ) were then computed and compared through a multivariate analysis of variance. We used this approach for all comparative food habits analyses.

Waterfowl Populations

The U.S. Fish and Wildlife Service (USFWS) in cooperation with the States conducts annual surveys of wintering waterfowl during January, when population distributions are most stable and perhaps most concentrated. According to Benning et al. (1978:1), "This survey primarily monitors annual changes in waterfowl distribution on the wintering grounds within the United States, and indicates annual population trends". Although survey results are affected by such factors as weather, personnel changes, and errors of omission (birds not found) and commission (birds found but counted inaccurately), they constitute the only long-term source of information on the distribution and abundance of wintering waterfowl. Most states have developed systems of survey areas which generally encompass rivers, bays, or large expanses of marsh habitat. Survey area boundaries were stable in Maryland (Figure 1) by 1956 and in Virginia (Figure 2) by 1961. Waterfowl surveys in the Potomac River, ocean bays, and inland reservoirs and swamps were not included in analyses of species distributions among survey areas, since comparable data on submerged aquatic vegetation were not available. Some waterfowl species (e.g., Atlantic brant, greater snow goose [_Anser caerulescens atlantica_]), whose populations were generally restricted to those habitats, were consequently omitted. An index to waterfowl survey areas used in this study is provided in Table 1.

The Atlantic Flyway, which encompasses Atlantic coastal States from Maine to Florida, is one of four U.S. flyways used in the management of waterfowl populations. United States and Atlantic Flyway populations can be used as measures of general abundance or trend that may affect

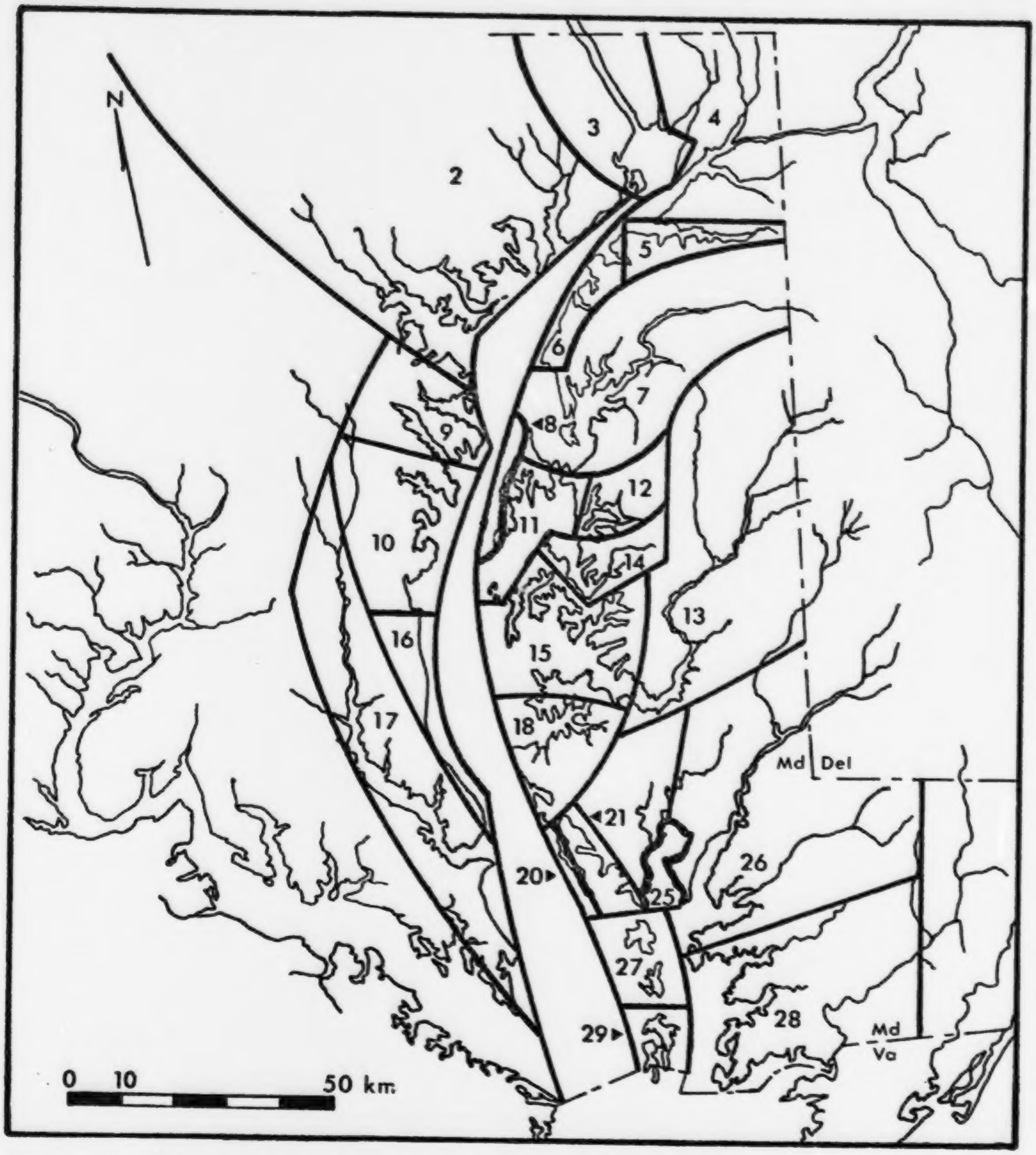
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Figure 1. Maryland waterfowl survey areas used in this report.

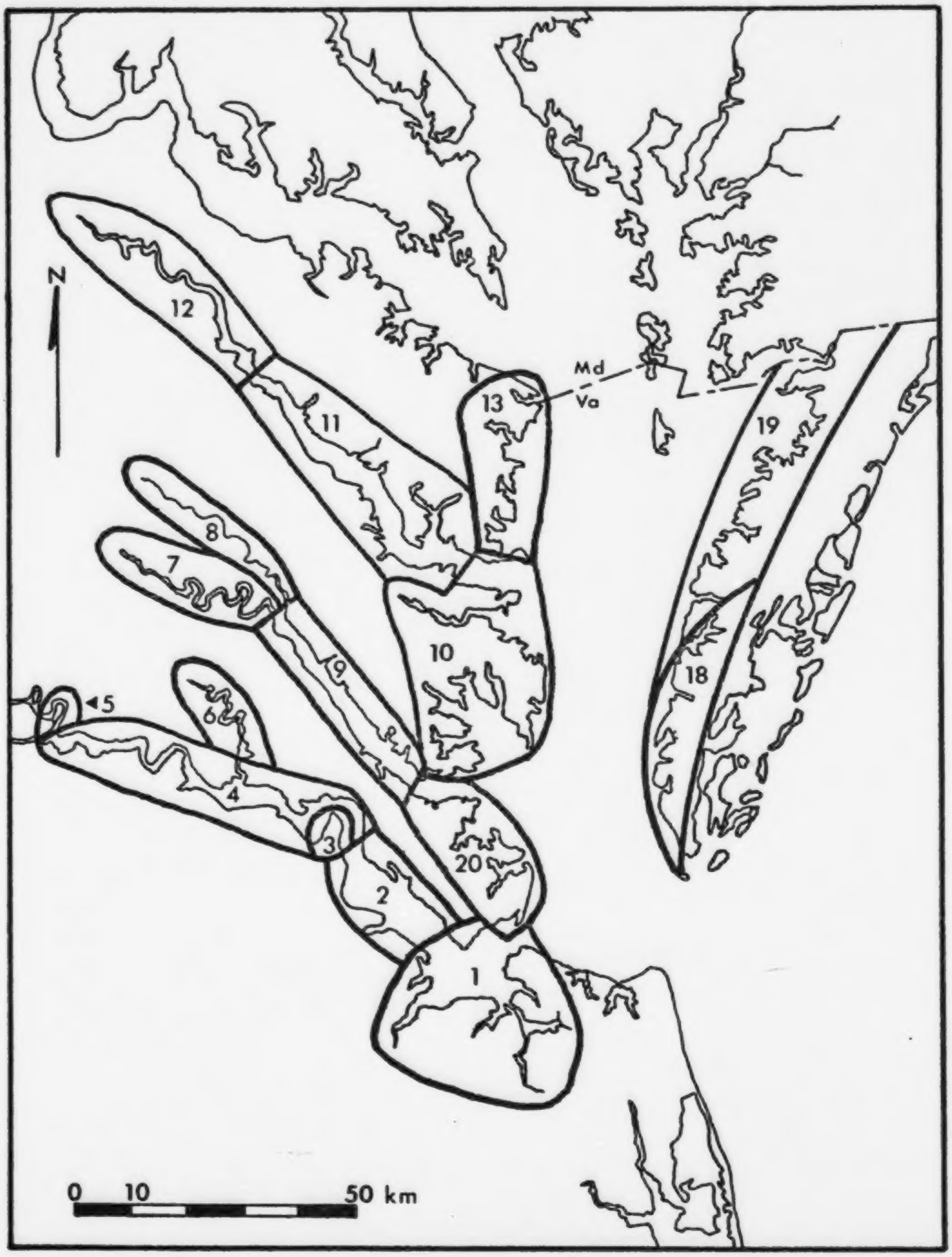
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Figure 2. Virginia waterfowl survey areas used in this report.

TABLE 1. INDEX TO WATERFOWL SURVEY AREAS[a] IN MARYLAND AND VIRGINIA

Maryland			Virginia	
Number	Size (ha)[b]	Survey area name	Number	Survey area name
2	17,227	Patapsco River - Aberdeen P.G.	1	James River (Lower)
3	8,076	Susquehanna Flats	2	James River (Middle)
4	4,528	Northeast - Elk - Bohemia Rivers	3	James River (Hog Island Refuge)
5	1,648	Sassafras River	4	James River (Upper)
6	2,444	Bayshore, Kent County	5	James River (Presquile NWR)
7	7,791	Chester River	6	Chickahominy River
8	2,214	Bayshore, Kent Island	7	Pamunkey River
9	4,502	Magothy - Severn Rivers	8	Mattaponi River
10	4,484	South River - Herring Bay	9	York River
11	7,953	Eastern Bay	10	Mobjack Bay and Piankatank River
12	1,775	Wye River	11	Rappahannock River (Lower)
13	2,073	Upper Choptank River	12	Rappahannock River (Upper)
14	2,159	Miles River	13	Smith Pt. - Windmill Pt.
15	13,159	Lower Choptank River	18	Fisherman's Island - Silver Beach
16	2,758	Bayshore, Calvert County	19	Silver Beach - Saxis
17	7,566	Patuxent River	20	Newport News - York River
18	7,515	Little Choptank River		
20	5,665	Bayshore, Hooper Island		
21	6,896	Honga River		
25	6,247	Fishing Bay		
26	7,366	Nanticoke - Wicomico Rivers		
27	11,446	Bloodsworth - South Marsh Islands		
28	13,816	Manokin, Big - Little Annemessex R.		
29	4,265	Smith Island		

---

[a] Maryland survey areas are shown in Figure 1, and those in Virginia are shown in Figure 2. Areas beyond the scope of this study (e.g., inland reservoirs, ocean bays) are not listed.

[b] Size equals the extent of shoal water habitat (<2.44 m at mlw) in a survey area.

Chesapeake Bay numbers of ducks, geese, or swans. We can also use these data to identify species that have a tradition of wintering in the Bay. Since waterfowl populations and habitats in Maryland and Virginia portions of the Bay are considerably different, we will consider populations in these areas separately.

We used mid-winter survey results prior to 1972 as measures of long-term distribution and abundance of United States, Atlantic Flyway, and Maryland and Virginia wintering waterfowl populations. We first identified waterfowl species whose Bay populations averaged five percent or more of Atlantic Flyway populations prior to 1972. Species that did not meet this criterion were subsequently omitted. For the remaining species we then examined population segments (survey areas, Flyway, and U.S.) for trends in distribution or abundance prior to the early 1970's. We used survey results during the years 1972-80 to describe current Bay waterfowl resources in a similar manner. Comparisons could then be made between waterfowl populations during the long-term and current periods, and between current waterfowl and SAV distribution and abundance.

Submerged Aquatic Vegetation

Stevenson and Confer (1978) summarized available information on the distribution and abundance of submerged aquatic vegetation (SAV) in Chesapeake Bay. Bayley et al. (1978) described long-term (1958-1975) changes in SAV at the head of the Bay (Susquehanna Flats), and Orth et al. (1979) documented the distribution and abundance of SAV in Virginia waters during the 1970's (1971,1974, and 1978). Kerwin et al. (1976) initiated an extensive (Maryland) and long-term (1971-) survey of SAV with which the distribution and abundance of waterfowl could be compared. Kerwin's study, which evolved into a cooperative effort between the USFWS Migratory Bird and Habitat Research Laboratory (MBHRL) and the Wildlife Administration of Maryland Department of Natural Resources (DNR), was based on a stratified random sampling (about 640 stations) of shoal water habitats (<2.44 m at mean low water) in Maryland (excluding the Potomac River). To monitor annual trends in distribution and abundance of SAV, established stations were sampled once each summer for presence/absence and percent composition of SAV. Procedures are further described in Kerwin et al. (1976).

Since waterfowl survey area boundaries did not correspond to those of the SAV survey, we examined latitude-longitude coordinates of sample stations in the SAV survey to resolve boundary discrepancies. We were then able to measure (planimeter) the extent of shoal water habitat in 24 waterfowl survey areas and summarize SAV survey results accordingly. We estimated hectares of SAV in an area by multiplying the size of the area by the proportion of stations sampled that were vegetated. These estimates of SAV are biased upwards due to the inherent assumption of complete coverage (dense bed) at a vegetated station. Use of these estimates to represent distribution and abundance of SAV during winter is another limitation.

STATISTICAL ANALYSES

Analyses of variance and linear regression used in this report followed the Statistical Analysis System user's guide (Barr et al. 1976). We generally used the simplest (fewest parameters) linear model that adequately described the relationship between a dependent and one or more independent variables. Where appropriate, area-specific effects were included if they were significant ($p < 0.05$). In models with more than one independent variable, we used sums of squares and corresponding

F statistics that reflected adjustments for all other variables in the model.

Given annual estimates of SAV (summer in year t-1) and waterfowl (January in year t) in a number of survey areas, we were then able to formulate the following linear model:

$$n_{a,t} = A + B_a\ (SAV_{a,t-1}) + C_a\ (ATL_t),$$

where $n_{a,t}$ is the predicted number of birds in survey area a, A is an overall intercept term, B_a is the area-specific effect of SAV, $SAV_{a,t-1}$ is the number of hectares of SAV in area a during the previous summer, C_a is the area-specific effect of general species abundance, and ATL_t is the Atlantic Flyway population during the current year t. The intercept term was included to determine if a significant portion of an area's population was independent of variation in SAV or general species abundance. The Atlantic Flyway population was included to measure the extent to which changes in an area's population merely reflected annual variation in the size of the general population. If an effect was not significant ($p > 0.05$), it was removed and a reduced model was then considered for that species.

SECTION 4

RESULTS AND DISCUSSION

WATERFOWL FOOD HABITS

A study of waterfowl food habits is a study of variability, some of which (e.g., areas and methods of collection) is unavoidable. More than 3,000 food habits records accumulated by Stewart (1962), Rawls (in prep.), and data from the files (MBHRL, Laurel, Maryland) included about 700 different food items (Appendix A). These data were tabulated by waterfowl species, time period (pre-1960, 1960's, and the 1970's in Appendices B, C, and D), and organ source (gizzard, gullet, or unknown).

Preliminary analyses using Johnson's (1980) methodology indicated there were substantial differences in usage (aggregate percentages) of food items in samples from different organs. Since this variation persisted across a number of waterfowl species, we restricted food habits comparisons to those species for which sufficient gizzard samples were available. We also were unable to statistically compare 1960's food habits data (Rawls, in prep.) with those from earlier or later periods, since we lacked data from individual samples.

A gross comparison of the incidence of plant material in samples of Bay waterfowl (Table 2) revealed only a few differences across three time periods. Based on aggregate percentages described earlier, usage of plant material by canvasbacks decreased from 71 to about 9 percent. A smaller decrease was also suggested for the common goldeneye (*Bucephala clangula americana*). Since other apparent changes were minor, the incidence of plant material in samples of Chesapeake Bay waterfowl has not considerably changed during the 1960's or 1970's.

There were exceptions to the general importance of vegetation to

TABLE 2. SUMMARY OF THE INCIDENCE OF PLANT MATERIAL IN THE DIET OF WATERFOWL THAT WINTER IN CHESAPEAKE BAY

	Percent plant material, and sample size ( )[a]					
Species	Pre-1960		1960's		1970's	
Whistling swan	74.7	(50)[b]	-	(-)	-	(-)
Canada goose	-	(-)	100.0	(221)	-	(-)
Ruddy duck	65.2	(25)	-	(-)	-	(-)
Bufflehead	24.6	(20)[b]	32.6	(27)	20.8	(30)
Common goldeneye	53.1	(14)	36.9	(45)	25.1	(21)
Canvasback	71.3	(47)	52.3	(246)	8.6	(273)
Greater scaup	40.4	(36)	37.2	(9)	32.8	(40)
Lesser scaup	51.4	(29)	56.7	(82)	57.9	(76)
Ring-necked duck	65.4	(17)	94.0	(10)	-	(-)
Redhead	99.0	(86)[b]	76.6	(77)	96.6	(7)
American wigeon	97.1	(35)	97.7	(121)	-	(-)
Blue-winged teal	90.7	(21)	-	(-)	-	(-)
Green-winged teal	84.9	(10)	100.0	(13)	91.3	(29)
Black duck	74.1	(55)	93.5	(131)	82.6	(57)
Gadwall	99.0	(21)[b]	-	(-)	-	(-)
Mallard	98.9	(25)	94.5	(134)	92.7	(84)
Pintail	97.5	(36)[b]	96.4	(47)	95.2	(27)

[a] Summarized from tables in Appendices B, C, and D. Unless otherwise noted, aggregate percentages are those from gizzard samples.

[b] Aggregate percentages are those from samples for which organs were not recorded.

puddle ducks and animal material to diving ducks. The diet of the black duck, a common puddle duck in the Bay, included perhaps 25 percent animal material whereas the redhead, a diving duck, fed almost exclusively on vegetation.

There were only a few species for which adequate samples were available from the pre-1960 (historic) and 1970's (current) periods. We were able to compare usage of important food items within periods for two puddle ducks (black duck and mallard) and two diving ducks (canvasback and lesser scaup [*Aythya affinis*]). For each of these species we listed the most important food items found in samples of these birds during the historic period (Appendix B). We then compared relative importance of listed food items during historic and current periods by testing the following null hypothesis: usage of historically important food items by the species has not changed.

Food items of historic importance to black ducks ranged from the intertidal salt marsh snail (*Melampus bidentatus*) to emergent marsh plants like twig-rush (*Cladium mariscoides*) and dotted smartweed (*Polygonum punctatum*) of fresh coastal areas (Table 3). Widgeongrass was the only SAV species considered important to black ducks during that period; utilization of widgeongrass, based on relative importance of the other food items examined, has not recently changed. Although the overall comparison indicated significant differences, recent changes in relative importance were restricted to emergent marsh plants.

Unlike black ducks, mallards are much more oriented to plant material including emergent plants of marshes, corn (*Zea mays*) of agricultural origin, and widgeongrass of shallow waters (Table 4). The relative importance of widgeongrass was again similar (as in black

TABLE 3. RESULTS OF TESTING THE HYPOTHESIS THAT USAGE OF HISTORICALLY IMPORTANT FOOD ITEMS BY BLACK DUCKS HAS NOT CHANGED

Important food items[a]		Current use[b]
Melampus bidentatus	salt marsh snail	
Cyprinodon variegatus	sheepshead minnow	
Fundulus heteroclites		
Ruppia maritima	widgeongrass	
Cladium mariscoides	twig-rush	less
Scirpus Olneyi	olney threesquare	less
Zizania aquatica	wildrice	
Polygonum punctatum	dotted smartweed	more
	Overall comparison: $F(8,80) = 5.75$, $p>F = 0.0001$[c]	

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[a] Important food items were identified on the basis of aggregate percentages (Appendix B).

[b] Current use, if significantly different (0.05 level), is either more or less during the 1970's than during the historic (pre-1960) period.

[c] We reject the hypothesis of no change, due to the highly significant test statistic for the overall comparison.

TABLE 4. RESULTS OF TESTING THE HYPOTHESIS THAT USAGE OF HISTORICALLY IMPORTANT FOOD ITEMS BY MALLARDS HAS NOT CHANGED

Important food items[a]		Current use[b]
Ruppia maritima	widgeongrass	
Cyperaceae	sedge	
Scirpus spp.	bulrush	less
Gramineae	grasses	
Zea mays	corn	more
Polygonum spp.	smartweed	

Overall comparison: $F(6,42) = 3.63$, $p>F = 0.0055$[c]

[a] Important food items were identified on the basis of aggregate percentages (Appendix B).

[b] Current use, if significantly different (0.05 level), is either more or less during the 1970's than during the historic (pre-1960) period.

[c] We reject the hypothesis of no change, due to the highly significant test statistic for the overall comparison.

ducks) during both periods, even though the overall comparison suggested recent changes for other items. The significantly higher rank of corn during the current period suggests an increase in the incidence of field feeding by mallards.

Although canvasbacks have always eaten invertebrates such as gastropod and pelecypod mollusks, they are best known as feeders on SAV, particularly wildcelery (Table 5). Of three SAV species compared, two decreased in relative importance during the current period. Decreases were also found in current use of some invertebrates, even though there was a substantial increase in the importance of the Baltic macoma clam. Small size classes (<25 mm) of these clams have recently become very important, as they were found in 93 percent of 273 gizzard samples (Appendix Table D-3). Extensive use of these clams by individual canvasbacks was also indicated since the aggregate percentage, which measures percentage by volume, averaged 84 percent.

Samples from lesser scaup, another diving duck, were similarly analyzed (Table 6). Current uses (ranks) of widgeongrass, redhead grass (Potamogeton perfoliatus), and wildcelery, all of which were historically important SAV species, are relatively similar. Gastropods contributed most to the overall difference in relative importance among the food items examined.

Since current use was compared to historic use, any items that are important now, but not historically, are not included here in comparative food habits analyses. Although diversity of food items currently available is undoubtedly less, there have been relatively recent additions to the Bay's flora and fauna. Springer and Stewart (1959) reported that by the late 1950's Eurasian watermilfoil (Myriophyllum

TABLE 5. RESULTS OF TESTING THE HYPOTHESIS THAT USAGE OF HISTORICALLY IMPORTANT FOOD ITEMS BY CANVASBACKS HAS NOT CHANGED

Important food items[a]		Current use[b]
Mollusca	mollusk	less
Pelecypoda (Bivalvia)	bivalve	less
Macoma balthica	Baltic macoma	more
Polychaeta	polychaete	less
Potamogeton pectinatus	sago pondweed	less
Potamogeton perfoliatus	redhead grass	
Vallisneria americana (spiralis)	wildcelery	less
Zea mays	corn	
Overall comparison: $F(8,298) = 94.79$, $p>F = 0.0001$[c]		

[a] Important food items were identified on the basis of aggregate percentages (Appendix B).

[b] Current use, if significantly different (0.05 level), is either more or less during the 1970's than during the historic (pre-1960) period.

[c] We reject the hypothesis of no change, due to the highly significant test statistic for the overall comparison.

TABLE 6. RESULTS OF TESTING THE HYPOTHESIS THAT USAGE OF HISTORICALLY IMPORTANT FOOD ITEMS BY LESSER SCAUP HAS NOT CHANGED

Important food items[a]		Current use[b]
Gastropoda	snail, limpet	less
Goniobasis virginica	snail	less
Gillia altilis	snail	
Amnicola spp.	amnicola	
Ruppia maritima	widgeongrass	
Potamogeton perfoliatus	redhead grass	
Vallisneria americana (spiralis)	wildcelery	
Overall comparison: F(7,67) = 10.21, p>F = 0.0001[c]		

[a] Important food items were identified on the basis of aggregate percentages (Appendix B).

[b] Current use, if significantly different (0.05 level), is either more or less during the 1970's than during the historic (pre-1960) period.

[c] We reject the hypothesis of no change, due to the highly significant test statistic for the overall comparison.

spicatum) had become well established on the Susquehanna Flats at the head of Chesapeake Bay, an area famous for waterfowl concentrations during fall months. Prior to 1960, milfoil was found only in samples of ruddy ducks (*Oxyura jamaicensis*, Appendix Table B-2), green-winged teal (*Anas crecca*, Appendix Table B-12), and gadwalls (*A. strepera*, Appendix Table B-14). During the 1960's, however, Rawls (in prep.) found milfoil in 13 species of waterfowl (Appendix C) including American wigeon, for which milfoil was very important (Appendix Table C-9). Milfoil is currently not utilized by waterfowl except in small amounts by a few individuals.

The brackish water clam (*Rangia cuneata*) is another recent member of the Bay's community (Pfitzenmeyer and Drobek 1964). This clam was not found in any samples of Bay waterfowl collected prior to 1960, but it has become increasingly important to diving ducks through the 1960's and into the current period.

Based on summaries of waterfowl food habits of 12 species, we conclude that except for the canvasback there have been few important changes in the incidence of plant material in samples of Chesapeake Bay waterfowl. Although current use of historically important food items was significantly different within each of four waterfowl species examined, changes in relative importance of invertebrates and emergent marsh plants contributed substantially to those differences. We conclude further that canvasbacks are adaptable diving ducks, since clams have become very important Bay food resources for these birds. This adaptation was most likely caused by recent declines in distribution and abundance of SAV.

Whistling swans apparently adapted to changing Bay conditions in another manner. Prior to 1970 few swans fed in agricultural fields while wintering in Maryland, even though this behavior was well established by swans while migrating during spring. Then during the late winter of 1969-70 significant numbers of swans began feeding in agricultural fields (principally corn and other cereal grains) following six weeks of freezing weather (V. D. Stotts, personal communication), which froze over much of the shoal water habitat in the upper Bay. Although this provided the initial stimulus, more and more swans began feeding in fields early (November) during subsequent winters when SAV was known to have declined. Field feeding by swans wintering in Maryland and other Flyway wintering areas has persisted to date (Munro, in prep.).

DISTRIBUTION AND ABUNDANCE OF SAV

We first considered SAV without regard to species (Table 7). SAV declined considerably during the early 1970's. From a high of 28.7 percent during 1971, frequency occurrence of vegetated sample stations in Maryland waters declined to 21.0 percent the following summer (after Tropical Storm Agnes). Frequency occurrence declined further during 1973 to 10.5 percent and has essentially fluctuated between 8-15 percent thereafter. Orth et al. (1979), in their study of the distribution and abundance of SAV in Virginia waters, also found a precipitous decline in SAV during the 1970's. Similarly, little SAV was found during the late 1970's in the Potomac River (Carter and Haramis 1980), largest of the Bay's numerous estuaries.

Based on nine-year averages, the lower Choptank River was the most important area in the Chesapeake Bay for SAV during the 1970's. One of the largest areas, the lower Choptank has consistently produced the most

TABLE 7. FREQUENCY OCCURRENCE OF SAV (SPECIES COMBINED) IN MARYLAND WATERFOWL SURVEY AREAS DURING THE YEARS 1971-1979[a]

Survey area [b]	Percent with vegetation, and sample size ( )								
	1971	1972	1973	1974	1975	1976	1977	1978	1979
Lower Choptank River	37.3 (51)	43.8 (48)	23.4 (47)	30.6 (49)	2.1 (47)	50.0 (46)	30.6 (49)	34.7 (49)	29.8 (47)
Manokin, Annemessex R.	42.1 (57)	38.2 (55)	16.1 (56)	41.2 (34)	19.2 (52)	15.8 (57)	19.6 (56)	10.9 (55)	0.0 (56)
Chester River	61.1 (36)	36.1 (36)	26.5 (34)	23.5 (34)	25.0 (36)	25.7 (35)	36.1 (36)	44.4 (36)	33.3 (36)
Eastern Bay	32.1 (28)	45.8 (24)	25.0 (28)	25.0 (28)	18.5 (27)	40.7 (27)	22.2 (27)	14.8 (27)	14.8 (27)
Smith Island (Maryland)	64.7 (17)	45.5 (11)	25.0 (12)	35.3 (17)	23.5 (17)	35.3 (17)	23.5 (17)	5.9 (17)	17.6 (17)
Bloodsworth, South Marsh I.	40.0 (40)	22.7 (44)	10.9 (46)	11.6 (43)	7.0 (43)	2.2 (45)	4.3 (46)	0.0 (46)	0.0 (45)
Honga River	50.0 (30)	40.0 (30)	13.3 (30)	16.7 (30)	10.3 (29)	17.2 (29)	3.3 (30)	3.3 (30)	0.0 (30)
Patapsco R., Aberdeen P.G.	7.7 (52)	4.0 (50)	4.0 (50)	5.8 (52)	9.1 (22)	5.8 (52)	11.5 (52)	5.8 (52)	7.7 (52)
Susquehanna Flats	54.5 (22)	3.3 (30)	0.0 (30)	16.7 (30)	13.3 (30)	10.3 (29)	13.3 (30)	3.4 (29)	6.9 (29)
Bayshore, Hooper Island	65.2 (23)	52.2 (23)	4.3 (23)	8.7 (23)	8.7 (23)	13.0 (23)	4.3 (23)	0.0 (23)	0.0 (23)
Magothy - Severn Rivers	37.0 (27)	11.1 (27)	22.2 (27)	22.2 (27)	. (0)	32.0 (25)	22.2 (27)	18.5 (27)	18.5 (27)
Miles River	50.0 (8)	50.0 (8)	50.0 (8)	50.0 (8)	25.0 (8)	42.9 (7)	50.0 (8)	50.0 (8)	0.0 (8)
Wye River	27.3 (11)	45.5 (11)	45.5 (11)	54.5 (11)	27.3 (11)	45.5 (11)	27.3 (11)	36.4 (11)	18.2 (11)
Little Choptank River	13.3 (30)	13.3 (30)	0.0 (30)	0.0 (30)	0.0 (30)	10.0 (30)	6.7 (30)	3.3 (30)	3.3 (30)
Patuxent River	2.0 (50)	4.4 (45)	0.0 (50)	4.0 (50)	0.0 (47)	2.0 (49)	2.0 (49)	2.0 (50)	2.1 (48)
Upper Choptank River	22.2 (9)	20.0 (10)	0.0 (10)	11.1 (9)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)
Fishing Bay	8.0 (25)	4.0 (25)	0.0 (25)	0.0 (25)	0.0 (24)	0.0 (25)	0.0 (25)	0.0 (25)	0.0 (24)
Sassafras River	30.0 (10)	0.0 (10)	0.0 (10)	10.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)
South River, Herring Bay	0.0 (21)	0.0 (21)	0.0 (21)	0.0 (19)	0.0 (14)	4.8 (21)	0.0 (21)	0.0 (21)	4.8 (21)
Northeast, Elk, Bohemia R.	5.0 (20)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (22)	0.0 (22)	0.0 (23)	0.0 (22)	4.3 (23)
Bayshore, Kent County	16.7 (12)	0.0 (6)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)
Bayshore, Kent Island	0.0 (8)	0.0 (8)	0.0 (8)	12.5 (8)	0.0 (8)	0.0 (8)	0.0 (8)	0.0 (8)	0.0 (8)
Total	28.7 (624)	21.0 (613)	10.5 (629)	14.9 (610)	8.7 (552)	15.0 (628)	12.4 (638)	10.1 (636)	7.9 (631)

[a] Data from the files of MBHRL, Laurel, Maryland.

[b] Frequency occurrence of SAV averaged over years, when multiplied by the extent of shoal habitat (<2.44 m at mlw) in an area, determined the sequence of survey areas used above.

SAV except during 1975 when abundance was extremely low. Another large area, which includes the Manokin, Big and Little Annemessex Rivers, and a portion of Pocomoke Sound, ranked second. Vegetation in this area declined after 1974 and was not found at all during the 1979 sampling. Among the most stable areas in the Bay for SAV are the Chester River and Eastern Bay.

The exposed bayshores, such as those along Kent County and Kent Island, are among the least vegetated shoal water habitats. Similarly, sample stations along the Calvert County Bayshore (not listed) have not yielded SAV during the 1970's, according to this survey.

Another overview of SAV distribution and abundance is provided in Table 8, where frequency occurrence is based on the presence of vegetation in measurable amounts (see Kerwin et al. 1976). Ranks of survey areas, based on average SAV abundance, are similar to those shown in Table 7, although the distribution of SAV (the number of areas listed) is reduced. Frequency occurrence of SAV during the nine-year period followed the same downward trend, but at a reduced scale.

Widgeongrass was the most abundant and widely distributed species of SAV during all nine years (Appendix Table E-1). Found in almost all Bay tributaries due to its wide salinity tolerance, widgeongrass was the most important food item for American wigeon historically (Appendix Table B-10) as well as during the 1960's (Appendix Table C-9). This species of SAV, which was also the most important food item for black ducks, is currently used to some extent by all waterfowl species examined except for the green-winged teal.

Widgeongrass is obviously very important to Bay waterfowl, but it may also comprise nearly 50 percent of all the SAV in Maryland waters;

TABLE 8. FREQUENCY OCCURRENCE OF MEASURABLE SAV (SPECIES COMBINED) IN MARYLAND WATERFOWL SURVEY AREAS DURING THE YEARS 1971-79[a]

Survey area[b]	Percent with vegetation, and sample size ( )								
	1971	1972	1973	1974	1975	1976	1977	1978	1979
Lower Choptank River	25.5 (51)	20.8 (48)	14.9 (47)	14.3 (49)	0.0 (47)	21.7 (46)	8.2 (49)	6.1 (49)	12.8 (47)
Manokin, Annemessex R.	33.3 (57)	12.7 (55)	10.7 (56)	17.6 (34)	5.8 (52)	14.0 (57)	12.5 (56)	0.0 (55)	0.0 (56)
Chester River	41.7 (36)	13.9 (36)	14.7 (34)	11.8 (34)	11.1 (36)	8.6 (35)	16.7 (36)	30.6 (36)	22.2 (36)
Eastern Bay	21.4 (28)	20.8 (24)	14.3 (28)	10.7 (28)	14.8 (27)	18.5 (27)	14.8 (27)	11.1 (27)	11.1 (27)
Smith Island (Maryland)	47.1 (17)	27.3 (11)	25.0 (12)	23.5 (17)	11.8 (17)	17.6 (17)	0.0 (17)	5.9 (17)	5.9 (17)
Bloodsworth, South Marsh I.	27.5 (40)	13.6 (44)	8.7 (46)	7.0 (43)	0.0 (43)	0.0 (45)	0.0 (46)	0.0 (46)	0.0 (45)
Patapsco R., Aberdeen P.G.	1.9 (52)	0.0 (50)	2.0 (50)	3.8 (52)	4.5 (22)	1.9 (52)	7.7 (52)	3.8 (52)	5.8 (52)
Honga River	30.0 (30)	23.3 (30)	3.3 (30)	3.3 (30)	3.4 (29)	3.4 (29)	0.0 (30)	3.3 (30)	0.0 (30)
Bayshore, Hooper Island	39.1 (23)	17.4 (23)	4.3 (23)	8.7 (23)	4.3 (23)	4.3 (23)	4.3 (23)	0.0 (23)	0.0 (23)
Magothy - Severn Rivers	33.3 (27)	7.4 (27)	14.8 (27)	14.8 (27)	. (0)	0.0 (25)	7.4 (27)	11.1 (27)	14.8 (27)
Susquehanna Flats	36.4 (22)	0.0 (30)	0.0 (30)	6.7 (30)	6.7 (30)	0.0 (29)	0.0 (30)	0.0 (29)	6.9 (29)
Miles River	12.5 (8)	37.5 (8)	12.5 (8)	12.5 (8)	25.0 (8)	28.6 (7)	25.0 (8)	12.5 (8)	0.0 (8)
Wye River	9.1 (11)	36.4 (11)	18.2 (11)	36.4 (11)	9.1 (11)	18.2 (11)	9.1 (11)	9.1 (11)	9.1 (11)
Little Choptank River	10.0 (30)	3.3 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (30)	3.3 (30)	3.3 (30)	0.0 (30)
Upper Choptank River	11.1 (9)	20.0 (10)	0.0 (10)	0.0 (9)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)
Fishing Bay	8.0 (25)	0.0 (25)	0.0 (25)	0.0 (25)	0.0 (24)	0.0 (25)	0.0 (25)	0.0 (25)	0.0 (24)
Sassafras River	20.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)
Northeast, Elk, Bohemia R.	5.0 (20)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (22)	0.0 (22)	0.0 (23)	0.0 (22)	0.0 (23)
Bayshore, Kent County	8.3 (12)	0.0 (6)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)
Patuxent River	0.0 (50)	0.0 (45)	0.0 (50)	2.0 (50)	0.0 (47)	0.0 (49)	0.0 (49)	0.0 (50)	0.0 (48)
Total	19.2 (624)	9.6 (613)	6.2 (629)	7.2 (610)	3.8 (552)	5.7 (628)	5.0 (638)	4.2 (636)	4.4 (631)

[a] Data from the files of MBHRL, Laurel, Maryland.

[b] Frequency occurrence of SAV averaged over years, when multiplied by the extent of shoal habitat (<2.44 m at mlw) in an area, determined the sequence of survey areas used above.

it certainly is the predominant species of SAV in Maryland's mesohaline (5-18 ppt) waters. Orth et al. (1979) found that eelgrass (Zostera marina) and widgeongrass were the most abundant SAV species in mesohaline and polyhaline (18-30 ppt) waters of Virginia.

Eelgrass was the second most abundant species during most years (Appendix Table E-2). Eelgrass was found in waters of higher salinity (>7 ppt), but as far north as Eastern Bay. Abundance of eelgrass, like other SAV species, declined considerably from 1972 to 1973. Although this species was found at 65 sample stations in Maryland waters during 1971, it was essentially absent (1 station) during 1979.

Eelgrass was not an important food resource for Bay waterfowl although it was found in small amounts in 11 of 16 species examined (Appendix B). This species was the principal food of the Atlantic brant prior to the wasting disease of the early 1930's, when eelgrass and brant populations plummeted (Lincoln 1950). These birds subsequently used sea lettuce (Ulva lactuca) as their principal food while wintering in Atlantic coastal areas. Sea lettuce, a marine alga found commonly in ocean bays and occasionally in Maryland waters (>7 ppt), is still the primary food of wintering brant (Penkala 1975).

Redhead grass was not an important waterfowl food, although small amounts of this item were found in 15 of 16 species examined (Appendix B). The distribution of redhead grass was restricted to only seven survey areas (Appendix Table E-3). Abundance of this species is greatest in the Chester River and Eastern Bay, both of which are among the most important waterfowl wintering areas.

Sago pondweed (Potamogeton pectinatus), historically important to canvasbacks (Appendix Table B-5) and redheads (Appendix Table B-9), is more widely distributed (Appendix Table E-4) but usually less abundant than redhead grass. Unlike other SAV species discussed previously, sago pondweed was infrequently found when this survey began in 1971. It was also uncommon during subsequent years.

Eurasian watermilfoil was a very abundant species during the early 1960's (Bayley et al. 1978). Although known to have displaced other SAV species during its peak in 1963 (Elser 1967), it was an uncommon plant during the 1970's (Appendix Table E-5). Milfoil was occasionally an important food item for waterfowl (Appendix C), but perhaps only when preferred foods were relatively scarce.

Horned pondweed (Zannichellia palustris) is another SAV species that was uncommon in late summer during the 1970's (Appendix Table E-6), and infrequently used by a number of waterfowl species. The distribution and abundance of this SAV species were the most erratic of those examined. It was essentially not recorded during four of the nine surveys. This may have been caused by variation between years in the timing of surveys, since horned pondweed apparently dies back during summer (Stevenson and Confer 1978; Carter and Haramis 1980; L. J. Hindman, personal communication).

Wildcelery, considered an excellent waterfowl food (Martin and Uhler 1951), was found in the fresher reaches of only a few areas in the Chesapeake Bay (Appendix Table E-7). Of the seven areas in which wildcelery was found, only four yielded this valuable plant after 1971. Based on frequency occurrence, wildcelery must now be considered an uncommon plant in shoal waters of the Bay. Although historically important to many waterfowl species (Appendix B), wildcelery is now infrequently found in samples from these birds (Appendix D).

We conclude that important waterfowl food plants, some of which were very common during the late 1960's and 1971, became much less abundant in both Maryland and Virginia waters particularly by 1973. Frequency occurrence, as a measure of SAV abundance in Maryland, indicated a downward trend in submerged aquatic plants as a group and for most species. The lower Choptank River, Manokin and Annemessex Rivers, Chester River, and Eastern Bay were consistently among the most important areas for a number of SAV species.

CHESAPEAKE BAY WATERFOWL POPULATIONS IN PERSPECTIVE

Numbers of waterfowl observed during January surveys were used to measure species abundance. Distribution of a species was first examined by comparing the State population to the Atlantic Flyway population, which was also compared to the United States total. Species distribution and abundance among waterfowl survey areas were then examined. We also examined the density of birds (per unit of shoal water habitat) in Maryland waterfowl survey areas. In all cases we tested a null hypothesis of no change in distribution/abundance of a species.

We used survey results during a previous long-term period (1956-71 in Maryland, 1961-71 in Virginia) to test for trends in distribution and abundance of waterfowl. These results provided a proper perspective with which current (1972-80) waterfowl populations could be compared.

Maryland

The Maryland portion of Chesapeake Bay has been the most important wintering area in the Atlantic Flyway for waterfowl in general. There is no other area along the entire Atlantic coast that was as important to so many birds of a variety of species. This was particularly true for whistling swans, Canada geese, and canvasbacks whose Maryland populations comprised over 50 percent of Atlantic Flyway totals (Table 9). Maryland was also an important wintering area (>15 percent of Flyway population) for ruddy ducks, buffleheads (*Bucephala albeola*), goldeneyes, redheads, black ducks, and mallards during the long-term period.

The whistling swan population was one of the few that increased during the 1956-71 period. Numbers of swans increased significantly at the State, Flyway, and U.S. levels. Current populations showed no further change in number or percentage of the Flyway population that wintered in Maryland. Routes of migration and wintering area site selection of these birds are among the most traditional of all waterfowl. The life-long bond between swan pairs and the maintenance of the family unit throughout the young's first year foster development of these traditions.

We examined survey area swan populations during the 1956-71 period (Appendix Table F-1) and found a percentage distribution that was essentially stable. The three most important areas for swans were the lower Choptank River, the Chester River, and Eastern Bay. Swan densities in these areas increased significantly, and mean densities were among the highest in the Bay.

The Canada goose population in the Atlantic Flyway changed dramatically during the 1956-71 period (Table 9). This population averaged over 500,000 geese and increased at about 25,000 birds/year, while Maryland's population averaged over 250,000 and increased at a similar rate. The importance of Maryland (i.e., the percentage of the Flyway population) increased at 2 percent/year. The goose population

TABLE 9. MARYLAND WINTERING WATERFOWL POPULATIONS COMPARED TO THOSE IN THE ATLANTIC FLYWAY AND THE UNITED STATES

Species and parameter [a]	1956 - 1971			1972 - 1980			1956 - 1980		
	U. S.	Atlantic	Maryland	U. S.	Atlantic	Maryland	U. S.	Atlantic	Maryland
Whistling swan									
Number: mean	96323	50390	32866	124394	68315	33977	106428	56843	33266
S.E.	6103.2	3334.6	2674.7	5078.6	2673.6	1448.2	5055.7	2896.6	1767.8
C.V.	25.3	26.5	32.6	12.2	11.7	12.8	23.8	25.5	26.6
slope est. (n)	3261.3	1853.4	1319.2	-	-	-	2413.7	1536.6	-
F value	9.51	10.89	7.36				22.44	35.94	
p > F	0.0081	0.0053	0.0168				0.0001	0.0001	
Percent: mean		52.6	64.7		55.4	50.6		53.6	59.6
S.E.		2.4	2.7		2.4	3.3		1.7	2.5
C.V.		18.1	16.7		13.2	19.4		16.3	20.8
slope est. (%)		-	-		-	-		-	-0.8
F value									6.96
p > F									0.0147
Canada goose									
Number: mean	1341418	515464	264709	2263228	791745	511164	1673270	614925	353433
S.E.	68019.8	34730.1	31169.4	89992.6	22743.7	14255.0	104785.3	35739.7	31561.1
C.V.	20.3	27.0	47.1	11.9	8.6	8.4	31.3	29.1	44.6
slope est. (n)	53052.3	24869.5	23117.1	71820.8	-	-	68244.1	22465.7	19973.1
F value	87.30	37.17	49.42	7.92			261.00	136.85	150.86
p > F	0.0001	0.0001	0.0001	0.0260			0.0001	0.0001	0.0001
Percent: mean		38.0	48.7		35.2	64.7		37.0	54.4
S.E.		1.1	3.1		0.8	1.4		0.8	2.6
C.V.		11.8	25.5		6.9	6.6		11.0	23.6
slope est. (%)		-	2.1		-	-		-	1.4
F value			23.79						44.01
p > F			0.0002						0.0001
Ruddy duck									
Number: mean	223187	61268	18526	164069	65441	10062	201905	62770	15479
S.E.	9493.4	5290.3	4736.9	11320.8	11229.8	2486.0	9218.5	5147.4	3225.6
C.V.	17.0	34.5	102.3	20.7	51.5	74.1	22.8	22.8	104.2
slope est. (n)	-	-	-	-	-	-	-3056.3	-	-934.4
F value							7.19		5.11
p > F							0.0133		0.0335
Percent: mean		27.5	26.9		39.8	17.6		31.9	23.5
S.E.		2.1	4.9		5.9	4.3		2.7	3.6
C.V.		30.3	73.6		44.8	74.2		42.7	76.3
slope est. (%)		-	-		5.1	-		-	-1.1
F value					10.87				6.40
p > F					0.0132				0.0187

(continued)

TABLE 9. (continued)

Species and parameter [a]	1 9 5 6 - 1 9 7 1			1 9 7 2 - 1 9 8 0			1 9 5 6 - 1 9 8 0		
	U. S.	Atlantic	Maryland	U. S.	Atlantic	Maryland	U. S.	Atlantic	Maryland
Scoters									
Number: mean	203367	113832	15937	162941	65177	11447	188814	96316	14321
S.E.	17006.4	13322.1	7786.2	16745.6	12296.1	1953.3	12846.2	10576.4	4990.1
C.V.	33.4	46.8	195.4	30.8	56.6	51.2	34.0	54.9	174.2
slope est. (n)	-	-	-	-	-	-	-	-	-
F value									
p > F									
Percent: mean		55.0	11.7		38.2	18.9		49.0	14.3
S.E.		4.1	3.8		3.2	3.5		3.3	2.8
C.V.		29.8	129.4		25.2	55.5		33.3	97.0
slope est. (%)		-	-		-	2.7		-1.0	-
F value						6.74		5.37	
p > F						0.0356		0.0297	
Bufflehead									
Number: mean	70457	36094	7161	99491	56300	11550	80909	43368	8741
S.E.	5157.9	3217.1	1328.3	4542.4	3699.8	1186.6	4605.4	3114.8	1029.4
C.V.	29.3	35.7	74.2	13.7	19.7	30.8	28.5	35.9	58.9
slope est. (n)	3330.8	1704.8	903.0	-	-	-	2599.1	1639.0	447.5
F value	20.21	9.25	26.55				51.22	34.49	15.94
p > F	0.0005	0.0088	0.0001				0.0001	0.0001	0.0006
Percent: mean		51.1	18.1		56.5	21.2		53.0	19.2
S.E.		1.9	2.2		2.4	2.8		1.5	1.7
C.V.		14.9	48.8		12.5	39.8		14.6	45.0
slope est. (%)		-	1.6		-	-2.1		-	0.5
F value			48.12			6.22			5.14
p > F			0.0001			0.0414			0.0331
Common goldeneye									
Number: mean	163204	74412	20104	136182	43897	9382	153476	63427	16244
S.E.	5752.7	3696.7	2362.2	5797.2	3407.1	2359.0	4927.5	3974.7	2000.8
C.V.	14.1	19.9	47.0	12.8	23.3	75.4	16.1	31.3	61.6
slope est. (n)	-	-	-	-	-	-	-1922.0	-2016.7	-623.9
F value							11.31	29.01	6.14
p > F							0.0027	0.0001	0.0210
Percent: mean		45.5	26.2		32.6	21.4		40.8	24.5
S.E.		1.4	2.4		2.5	4.6		1.8	2.2
C.V.		12.0	36.9		22.9	63.9		21.5	46.0
slope est. (%)		-	-		-2.2	-		-0.8	-
F value					11.96			19.31	
p > F					0.0106			0.0002	

(continued)

TABLE 9. (continued)

Species and parameter[a]	1956 - 1971 U. S.	1956 - 1971 Atlantic	1956 - 1971 Maryland	1972 - 1980 U. S.	1972 - 1980 Atlantic	1972 - 1980 Maryland	1956 - 1980 U. S.	1956 - 1980 Atlantic	1956 - 1980 Maryland
Canvasback									
Number: mean	282184	144355	87154	276858	125132	51743	280267	137435	74406
S.E.	17947.4	11582.9	9959.7	20078.2	6687.4	3431.0	13322.6	7910.7	7288.9
C.V.	25.4	32.1	45.7	21.8	16.0	19.9	23.8	28.8	49.0
slope est. (n)	-8908.9	-	-	19442.7	5766.0	-	-	-	-2612.1
F value	7.51			25.02	11.40				8.87
p > F	0.0160			0.0016	0.0118				0.0067
Percent: mean		51.4	58.4		45.9	42.6		49.4	52.7
S.E.		2.6	2.8		1.4	3.8		1.8	2.7
C.V.		20.5	19.2		9.4	26.8		18.4	25.6
slope est. (%)		-	-		-1.2	-3.3		-	-1.1
F value					9.44	11.92			11.62
p > F					0.0180	0.0107			0.0024
Scaup									
Number: mean	1751278	663500	54371	1239881	419978	41178	1567175	575832	49621
S.E.	134166.9	33318.2	7833.6	88784.1	33431.7	10112.4	103232.2	33874.3	6203.9
C.V.	30.6	20.1	57.6	21.5	23.9	73.7	32.9	29.4	62.5
slope est. (n)	-	-	-	-	-	-	-29921.5	-14869.3	-
F value							5.12	16.48	
p > F							0.0334	0.0005	
Percent: mean		40.8	8.3		35.2	9.2		38.8	8.6
S.E.		3.4	1.3		3.6	1.8		2.5	1.0
C.V.		32.9	60.5		30.6	58.3		32.5	58.6
slope est. (%)		-	0.6		-	-		-	0.1
F value			5.26						
p > F			0.0379						
Redhead									
Number: mean	568157	127395	37908	528011	127539	6287	553705	127447	26524
S.E.	69603.8	15382.6	6842.0	62419.7	8207.9	1348.4	49202.6	10135.8	5342.4
C.V.	49.0	48.3	72.2	35.5	19.3	64.3	44.4	39.8	100.7
slope est. (n)	-	-	-	-	-	-	-	-	-2531.3
F value									21.78
p > F									0.0001
Percent: mean		24.5	30.7		28.2	5.2		25.8	21.5
S.E.		2.6	4.8		4.5	1.1		2.3	4.0
C.V.		43.0	64.4		47.8	66.2		44.7	91.8
slope est. (%)		1.3	-2.3		-	-		-	-2.0
F value		8.10	6.60						31.06
p > F		0.0130	0.0223						0.0001

(continued)

TABLE 9. (continued)

Species and parameter a		1956 - 1971			1972 - 1980			1956 - 1980		
		U. S.	Atlantic	Maryland	U. S.	Atlantic	Maryland	U. S.	Atlantic	Maryland
American wigeon										
Number:	mean	1631096	106334	15921	1301655	70648	1777	1512497	93487	10829
	S.E.	65204.8	5928.1	2780.0	53427.0	5199.8	394.4	55543.7	5433.9	2242.9
	C.V.	16.0	22.3	69.8	12.3	22.1	66.6	18.4	29.1	103.6
	slope est. (n)	-	-2609.5	-1443.8	-	-	-	-20596.0	-2626.1	-1171.9
	F value		5.30	8.66				9.76	23.57	33.30
	p > F		0.0372	0.0107				0.0048	0.0001	0.0001
Percent:	mean		6.7	13.9		5.4	2.7		6.3	9.9
	S.E.		0.5	1.9		0.4	0.6		0.4	1.7
	C.V.		28.9	55.3		20.3	67.6		28.3	83.6
	slope est. (%)		-	-1.1		-	-		-0.1	-0.9
	F value			11.57					5.59	47.41
	p > F			0.0043					0.0269	0.0001
Black duck										
Number:	mean	502796	330573	69395	363702	253264	26663	452722	302742	54011
	S.E.	17947.9	11762.8	7572.8	17440.6	8047.7	2464.9	18737.2	10976.9	6418.5
	C.V.	14.3	14.2	43.6	14.4	9.5	27.7	20.7	18.1	59.4
	slope est. (n)	-11247.0	-6016.2	-3391.4	-13263.1	-	-	-11257.3	-6096.2	-3322.9
	F value	17.55	8.24	5.56	6.51			82.54	46.33	31.85
	p > F	0.0009	0.0123	0.0335	0.0380			0.0001	0.0001	0.0001
Percent:	mean		66.0	20.5		70.1	10.5		67.5	16.9
	S.E.		1.4	1.5		1.6	0.8		1.1	1.4
	C.V.		8.3	29.9		6.9	23.6		8.2	41.6
	slope est. (%)		-	-		-	-		0.3	-0.7
	F value								6.25	28.6
	p > F								0.0200	0.0001
Mallard										
Number:	mean	7916455	231971	42137	6754796	211626	26410	7498258	224647	36475
	S.E.	365513.8	17025.0	8998.4	365612.6	15832.0	2663.8	287116.0	12247.2	5967.8
	C.V.	18.5	29.4	85.4	16.2	22.4	30.3	19.1	27.3	81.8
	slope est. (n)	-	-7424.7	-	-	11961.6	-	-108560.6	-	-
	F value		5.16			6.35		10.32		
	p > F		0.0394			0.0398		0.0039		
Percent:	mean		2.9	16.9		3.2	12.6		3.0	15.3
	S.E.		0.2	2.3		0.3	1.0		0.1	1.6
	C.V.		22.9	55.0		26.0	24.6		24.0	51.2
	slope est. (%)		-	-		0.3	-		-	-
	F value					20.76				
	p > F					0.0026				

(continued)

TABLE 9. (continued)

Species and parameter[a]		1956 - 1971			1972 - 1980			1956 - 1980		
		U. S.	Atlantic	Maryland	U. S.	Atlantic	Maryland	U. S.	Atlantic	Maryland
Pintail										
Number:	mean	3729626	186798	13254	5191300	82211	797	4255828	149147	8769
	S.E.	204038.2	19327.9	4166.9	211202.2	5863.3	160.8	206193.4	16079.8	2904.8
	C.V.	21.9	41.4	125.8	12.2	21.4	60.6	24.2	53.9	165.6
	slope est. (n)	-	-10981.3	-2306.1	-	-	-	84776.2	-8793.2	-1294.6
	F value		11.80	10.73				13.29	42.33	17.37
	p > F		0.0040	0.0055				0.0014	0.0001	0.0004
Percent:	mean		5.1	6.1		1.6	1.0		3.8	4.2
	S.E.		0.4	1.3		0.1	0.2		0.4	1.0
	C.V.		30.8	88.1		25.7	63.4		55.2	115.6
	slope est. (%)		-0.2	-0.7		-	-		-0.3	-0.4
	F value		15.75	7.16					95.83	19.09
	p > F		0.0014	0.0181					0.0001	0.0002

[a] Populations (number and/or percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level). The Atlantic Flyway is shown as a percentage of the U.S. population, and the State is shown as a percentage of the Flyway population.

stabilized during the current period but at a much higher level. Maryland now winters more than 500,000 Canada geese. This increase, which began during the 1950's, was caused by a wintering range expansion of geese into agricultural lands particularly on Maryland's Eastern Shore.

The distribution of geese in Maryland was stable, since only a few minor (<1 percent) changes were detected during the long-term period (Appendix Table F-2). Unlike other populations examined, densities of birds increased in almost all areas. The Chester River, where goose populations averaged 25 percent of the State total, was the most important area, although the highest density (>14 birds/ha) was found in the Sassafras River population.

We found minor changes in long-term and current Maryland populations of ruddy ducks, scoters, buffleheads, goldeneyes, and scaup, all of which are diving ducks and not primarily vegetarian in food preferences. Species distributions within Maryland (Appendix F) were generally stable, and densities were relatively low (except for scoters along Calvert County's Bayshore (Appendix Table F-4). Important areas varied, although the lower Choptank River and bayshore areas were frequently prominent.

More than half the Atlantic Flyway canvasback population wintered in Maryland during the 1956-71 period. During the current period, the Flyway population increased in number but decreased as a proportion of the U. S. total. Although the current Maryland population showed no trend, it averaged about 51,000 birds which was considerably less than the long-term average of 87,000 canvasbacks. The percentage of the current Flyway population that wintered in Maryland showed a definite downward trend of about -3 percent/year, although the canvasback is still the most numerous duck in Maryland. Survey area populations of canvasbacks (Appendix Table F-7) were stable in density and percent distribution. The three most important areas were the lower Choptank River, Calvert County Bayshore, and the Patuxent River.

The Maryland redhead population averaged about 38,000 birds prior to 1972 with no detectable trend. However, there was a significant decrease (-2 percent/year) in the proportion of the Flyway population found in Maryland. Current redhead populations, although stable, averaged only about 6,000 birds. This formerly abundant diving duck is now found only in small numbers in Maryland. Area redhead populations (Appendix Table F-9) were largest in the lower Choptank River, although density there trended downward significantly during the 1956-71 period. The percent distribution of redheads among Maryland survey areas was stable.

Average State populations (numbers) of wigeon, black ducks, and pintails all decreased significantly during the long-term period (Table 9). Although current numbers of each species stabilized at lower levels, average numbers of wigeon (1,800) and pintails (800) are now minimal. Flyway populations of these three puddle ducks also trended downward during the long-term which partially explains their current scarcity. However, the Maryland wigeon population formerly comprised about 14 percent of the Flyway population and it now represents less than 3 percent. Similarly, Maryland became less important to Flyway black ducks (20 - 10 percent) and pintails (6 - 1 percent). The Chester River, Eastern Bay, and the lower Choptank River were among the three most important areas for wigeon (Appendix Table F-10), black ducks

(Appendix Table F-11), and pintails (Appendix Table F-13), except for Smith Island which was the most important pintail area. Within-State distribution of wigeon changed more than any other species population examined. The Chester River became less important to wintering wigeon at a rate of -1.3 percent/year during the 1956-71 period.

The Maryland mallard population currently averaged about 26,000 birds which is less than the long-term average of 42,000 birds. On a percentage basis, Maryland was only slightly less important to current Flyway mallard populations (about 13 percent) than during the long-term (17 percent). Mallards, which are closely related to black ducks, were also most abundant in the Chester River (Appendix Table F-12).

Virginia

Virginia populations of whistling swans and Canada geese (Table 10), although stable during the long-term (1961-71), both increased significantly in number and as a percentage of Atlantic Flyway total during the current period (1972-80). Most swans in Virginia wintered in areas such as ocean bays, which are beyond the scope of this study (Appendix Table G-1). The most important area for Canada geese was the Presquile National Wildlife Refuge (NWR) on the James River, where the number of geese increased significantly during the 1961-71 period (Appendix Table G-2). However, the distribution of geese in other Virginia survey areas was essentially stable.

The ruddy duck population in Virginia averaged about 16,000 birds or 30 percent of the Flyway population, with no apparent trends during the 1961-71 period (Table 10). This population recently (1972-80) averaged only 6,400 birds, an average that was stable but lower than the previous long-term level. The distribution of ruddy ducks in Virginia

TABLE 10. VIRGINIA WINTERING WATERFOWL POPULATIONS COMPARED TO THOSE IN THE ATLANTIC FLYWAY AND THE UNITED STATES

Species and parameter [a]	1961 - 1971			1972 - 1980			1961 - 1980		
	U. S.	Atlantic	Virginia	U. S.	Atlantic	Virginia	U. S.	Atlantic	Virginia
Whistling swan									
Number: mean	104572	57326	3605	124394	68315	4357	113492	62271	3943
S.E.	7599.4	2682.1	1234.8	5078.6	2673.6	881.5	5169.4	2238.2	772.0
C.V.	24.1	15.5	113.6	12.2	11.7	60.7	20.4	16.1	87.5
slope est. (n)	-	-	-	-	-	800.9	2111.4	974.5	-
F value						15.43	7.42	8.94	
p > F						0.0057	0.0139	0.0079	
Percent: mean		56.2	6.4		55.4	6.3		55.9	6.4
S.E.		2.6	2.0		2.4	1.2		1.7	1.2
C.V.		15.2	105.7		13.2	58.9		14.0	86.0
slope est. (%)		-	-		-	1.1		-	-
F value						13.67			
p > F						0.0077			
Canada goose									
Number: mean	1477593	581004	46146	2263228	791745	54385	1831129	675837	49854
S.E.	63256.4	31690.0	8404.2	89992.6	22743.7	7316.6	103599.8	31100.4	5610.1
C.V.	14.2	18.1	60.4	11.9	8.6	40.4	25.3	20.6	50.3
slope est. (n)	57348.5	27440.7	-	71820.8	-	5470.6	74445.9	21515.4	-
F value	41.54	26.97		7.92		6.11	168.83	92.79	
p > F	0.0001	0.0006		0.0260		0.0428	0.0001	0.0001	
Percent: mean		39.2	7.8		35.2	6.7		37.4	7.3
S.E.		0.9	1.0		0.8	0.8		0.7	0.6
C.V.		7.3	42.9		6.9	34.3		8.9	39.6
slope est. (%)		-	-		-	0.6		-0.3	-
F value						6.59		6.15	
p > F						0.0371		0.0233	
Ruddy duck									
Number: mean	229553	57629	15962	164069	65441	6414	200085	61144	11665
S.E.	12295.8	4983.2	3204.5	11320.8	11229.8	1669.3	11131.3	5646.0	2165.2
C.V.	17.8	28.7	66.6	20.7	51.5	78.1	24.9	41.3	83.0
slope est. (n)	-	-	-	-	-	-	-5459.5	-	-856.2
F value							13.09		6.78
p > F							0.0020		0.0179
Percent: mean		25.2	29.6		39.8	9.3		31.8	20.5
S.E.		1.9	5.5		5.9	2.3		3.2	3.9
C.V.		25.0	61.9		44.8	74.2		45.7	85.1
slope est. (%)		-	-		5.1	-		1.4	-1.6
F value					10.87			9.10	7.29
p > F					0.0132			0.0074	0.0146

(continued)

TABLE 10. (continued)

Species and parameter a	1961 - 1971			1972 - 1980			1956 - 1980		
	U. S.	Atlantic	Virginia	U. S.	Atlantic	Virginia	U. S.	Atlantic	Virginia
Scoters									
Number: mean	221379	123289	3581	162941	65177	10433	195082	97139	6664
S.E.	22338.7	18134.9	1213.3	16745.6	12296.1	5334.3	15558.6	12955.2	2535.6
C.V.	33.5	48.8	112.4	30.8	56.6	153.4	35.7	59.6	170.1
slope est. (n)	-	-	-	-	-	-	-	-	-
F value									
p > F									
Percent: mean		54.1	3.3		38.2	11.1		47.0	6.8
S.E.		5.3	1.2		3.2	3.6		3.7	1.9
C.V.		32.4	118.1		25.2	98.2		34.8	125.9
slope est. (%)		-	-		-	-		-	-
F value									
p > F									
Bufflehead									
Number: mean	81157	41986	2678	99491	56300	11638	89408	48427	6710
S.E.	4130.3	3357.8	649.4	4542.4	3699.8	2905.3	3636.8	2920.0	1663.5
C.V.	16.9	26.5	80.4	13.7	19.7	74.9	18.2	27.0	110.9
slope est. (n)	-	-	-	-	-	-	1798.7	1292.8	856.4
F value							13.47	9.40	15.57
p > F							0.0017	0.0067	0.0009
Percent: mean		51.2	5.8		56.5	19.5		53.6	11.9
S.E.		2.2	1.2		2.4	4.3		1.7	2.5
C.V.		14.1	68.4		12.5	66.3		14.0	94.6
slope est. (%)		-	-		-	-		-	1.4
F value									18.38
p > F									0.0004
Canvasback									
Number: mean	261908	145114	9593	276858	125132	9304	268636	136122	9463
S.E.	15941.1	12629.5	1936.1	20078.2	6687.4	1776.5	12363.5	7736.1	1297.7
C.V.	20.2	28.9	66.9	21.8	16.0	57.3	20.6	25.4	61.3
slope est. (n)	-	-	-	19442.7	5766.0	-	-	-	-
F value				25.02	11.40				
p > F				0.0016	0.0118				
Percent: mean		54.7	7.4		45.9	7.2		50.7	7.3
S.E.		2.1	1.9		1.4	1.3		1.6	1.2
C.V.		12.5	86.0		9.4	55.6		14.3	72.4
slope est. (%)		-1.4	-		-1.2	-		-1.0	-
F value		6.81			9.44			32.84	
p > F		0.0283			0.0180			0.0001	

(continued)

TABLE 10. (continued)

Species and parameter[a]	1961 - 1971			1972 - 1980			1956 - 1980		
	U. S.	Atlantic	Virginia	U. S.	Atlantic	Virginia	U. S.	Atlantic	Virginia
American wigeon									
Number: mean	1638719	102944	3692	1301655	70648	4968	1487040	88411	4266
S.E.	67149.6	7250.0	1030.9	53427.0	5199.8	1285.7	57671.9	5824.5	801.3
C.V.	13.6	23.4	92.6	12.3	22.1	77.6	17.3	29.5	84.0
slope est. (n)	-	-	-	-	-	-	-31908.6	-3043.7	-
F value							20.77	16.48	
p > F							0.0002	0.0007	
Percent: mean		6.4	3.8		5.4	7.0		6.0	5.2
S.E.		0.5	1.1		0.4	1.8		0.3	1.0
C.V.		27.1	97.2		20.3	76.4		25.6	89.6
slope est. (%)		-	-		-	-		-	-
F value									
p > F									
Black duck									
Number: mean	471543	316614	17405	363702	253264	19988	423015	288106	18567
S.E.	14446.7	9092.6	2200.2	17440.6	8047.7	4473.3	16417.7	9406.4	2297.8
C.V.	10.2	9.5	41.9	14.4	9.5	67.1	17.4	14.6	55.3
slope est. (n)	-	-5503.3	-1666.2	-13263.1	-	-	-10292.6	-6097.1	-
F value		5.20	12.10	6.51			39.65	49.99	
p > F		0.0485	0.0070	0.0380			0.0001	0.0001	
Percent: mean		67.3	5.4		70.1	8.1		68.6	6.6
S.E.		1.3	0.6		1.6	1.8		1.1	0.9
C.V.		6.6	38.1		6.9	68.2		6.9	62.0
slope est. (%)		-	-0.4		-	1.4		-	-
F value			9.27			7.21			
p > F			0.0139			0.0313			
Mallard									
Number: mean	7320124	206971	8008	6754796	211626	20325	7065726	209066	13551
S.E.	356716.6	12060.4	1130.7	365612.6	15832.0	4311.5	257536.7	9480.5	2422.5
C.V.	16.2	19.3	46.8	16.2	22.4	63.6	16.3	20.3	80.0
slope est. (n)	-	-	-	-	11961.6	-	-	-	1073.9
F value					6.35				9.44
p > F					0.0398				0.0066
Percent: mean		2.9	4.0		3.2	9.1		3.0	6.3
S.E.		0.2	0.5		0.3	1.5		0.2	0.9
C.V.		18.5	44.5		26.0	48.6		22.7	65.1
slope est. (%)		-	-		0.3	-		-	0.4
F value					20.76				10.09
p > F					0.0026				0.0052

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[a] Populations (number and/or percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level). The Atlantic Flyway is shown as a percentage of the U.S. population, and the State is shown as a percentage of the Flyway population.

was the most restricted of all species populations examined. More than half of the State population wintered in the lower Rappahannock River area (Appendix Table G-3).

Populations of scoters and buffleheads, although stable in previous and current periods, both increased during the latter period; canvasback and wigeon populations, on the other hand, remained unchanged but at low levels (Table 10). The lower Rappahannock River was the most important canvasback area within a stable State distribution (Appendix Table G-6), whereas the lower James River was most important to wigeon (Appendix Table G-7).

The black duck population decreased significantly in Virginia and the Atlantic Flyway prior to 1971, and then stabilized during the current period. On a proportional basis, Virginia became more important to Flyway black ducks at a rate of 1.4 percent/year from 1972 to 1980. The Pamunkey River was the most important black duck area, although a significant downward trend in numbers of black ducks was indicated for that area (Appendix Table G-8).

The Virginia mallard population, which previously averaged 8,000 birds, recently increased to about 20,000 birds or 9 percent of the Flyway total. As with the black duck, the Pamunkey River was the most important area (Appendix Table G-9).

We conclude that Maryland waterfowl populations prior to the 1970's were considerably larger and more diverse than those in Virginia. While many duck populations in Maryland decreased during the 1970's, those in Virginia increased or remained stable. Maryland populations of Canada geese and whistling swans, in contrast to ducks, greatly increased (geese) or remained stable (swans).

EFFECTS OF SAV ON WATERFOWL

We have demonstrated that some Chesapeake Bay waterfowl species feed principally on vegetation (including SAV), while others do not or at least not to an appreciable extent. We have also shown that, while waterfowl species distributions among survey areas were generally stable prior to the 1970's, there have been significant changes in numbers of birds at the State level and/or in the importance of Maryland and Virginia to Atlantic Flyway populations. We are now able to examine the relationship between the distribution and abundance of waterfowl and the distribution and abundance of SAV in Maryland during the 1972-80 period.

Although some SAV species are more important than others as waterfowl food resources, all were combined in the analyses presented here. As in previous analyses of waterfowl distributions, birds surveyed in upland, inland reservoir, and ocean bay habitats were excluded. Of the 13 waterfowl species whose Maryland populations were previously examined, 4 were excluded from consideration here due to the scarcity of their numbers during the 1972-80 period. These are the ruddy duck, redhead, wigeon, and pintail. Maryland populations of the latter three species, which feed extensively on SAV, are currently at their lowest recorded levels.

The remaining nine populations were each run through the simple linear model described earlier (see STATISTICAL ANALYSES), which examined the hypothesis that annual variation in survey area populations is related to annual variation in the distribution and abundance of SAV and the general abundance of the species. Appropriateness of the full model was not the same for the nine species populations. We therefore examined a number of alternative or reduced models, based on preliminary results. For example, if an analysis indicated that SAV had no measurable effect on numbers of sea ducks, a more appropriate or efficient model would not include an SAV term. For each species, we removed non-significant ($p > 0.05$) parameters and reran the analysis. The analyses presented here are therefore the simplest, as they include only significant effects.

Swans and Geese

Whistling swans and Canada geese in Maryland provide an interesting comparison. Both are large, long-lived birds with stable or increasing populations. Maryland is the most important wintering area in the Atlantic Flyway for both populations. Although both feed in agricultural fields, swans have done so to an appreciable extent only during the 1970's.

Our analysis of survey area swan populations (Table 11) indicates there is a measurable effect of SAV abundance on numbers of swans in a few areas, all of which were important wintering areas during the previous long-term period (Appendix Table F-1). For example, the effect of SAV on swan numbers in Eastern Bay was significant (1.2 birds/ha of SAV). We also found a significant intercept (1,753 birds), which measures the level of a survey area's population that is independent of variation in either SAV or the general abundance of swans. The Wye River swan population was exceptional due to the rather large, negative relationship with SAV abundance, which was caused by large numbers of swans when SAV was uncommon. This area has recently become an important loafing area for an increasing number of field-feeding swans.

In contrast to swans, there is no relationship ($p > 0.05$) between distribution and abundance of Canada geese and SAV in Maryland (Table

TABLE 11. RESULTS OF TESTING THE HYPOTHESIS THAT MARYLAND SURVEY AREA POPULATIONS OF WHISTLING SWANS ARE RELATED TO THE DISTRIBUTION AND ABUNDANCE OF SAV, AND THE GENERAL ABUNDANCE (ATLANTIC FLYWAY POPULATION) OF THE SPECIES

Source[a]	df	F value	p>F	Parameter estimate
Intercept	1	4.20	0.0419	1753.
SAV * Survey area	22	1.90	0.0126	
Eastern Bay	(1)	7.45	0.0070	1.222
Chester River	(1)	7.24	0.0078	1.127
Lower Choptank River	(1)	11.83	0.0007	0.7685
Wye River	(1)	9.67	0.0022	-5.997
Flyway * Survey area	24	2.11	0.0034	
Wye River	(1)	12.74	0.0005	0.0780

[a] Parameter estimates and test statistics are shown for individual survey areas only if significantly different (p<.05) from zero.

12). Numbers of geese in survey areas are entirely explained by variation in the Atlantic Flyway population. In fact, populations of geese on Maryland's Eastern shore may be responsible for much of the variation in the Atlantic Flyway total. Open water areas are now used mostly for loafing and protection from predators, as geese have become essentially dependent on surrounding agricultural lands for food.

Black Ducks and Mallards

These species have been and continue to be the most common and widely distributed puddle ducks in Maryland, although current populations of both are considerably less than long-term levels. We found that black duck numbers in the Chester River were significantly related to the abundance of SAV (about 3 birds/ha of SAV, Table 13). This area was also the most important wintering area for black ducks during the 1956-71 period (Appendix Table F-11). Black ducks in the Honga River and Bloodsworth-South Marsh Islands areas also varied with SAV, but at lesser rates (about 0.6 birds/ha of SAV). Populations in a number of other areas varied with the general abundance of the species.

Mallard numbers in the Chester River were also related to the abundance of SAV (about 2.7 birds/ha of SAV, Table 14). However, bird numbers in other areas were not similarly affected. Although mallards are found in all survey areas, most of the variation in population size was related to the general abundance of mallards in a few areas, except in the Chester River.

Diving Ducks

Although plant material comprised only 25-30 percent of the food habits of buffleheads, we found that numbers of these birds in the Manokin, Annemessex Rivers and Eastern Bay areas were related to the

TABLE 12. RESULTS OF TESTING THE HYPOTHESIS THAT MARYLAND SURVEY AREA POPULATIONS OF CANADA GEESE ARE RELATED TO THE DISTRIBUTION AND ABUNDANCE OF SAV, AND THE GENERAL ABUNDANCE (ATLANTIC FLYWAY POPULATION) OF THE SPECIES

Source[a]	df	F value	p>F	Parameter estimate
Flyway * Survey area	24	165.10	0.0001	
Chester River	(1)	2,714.41	0.0001	0.1899
Bayshore, Kent County	(1)	320.77	0.0001	0.0653
Lower Choptank River	(1)	251.22	0.0001	0.0578
Sassafras River	(1)	221.71	0.0001	0.0543
Northeast - Elk - Bohemia Rivers	(1)	162.82	0.0001	0.0465
Wye River	(1)	97.02	0.0001	0.0359
Upper Choptank River	(1)	64.32	0.0001	0.0292
Eastern Bay	(1)	57.15	0.0001	0.0275
Miles River	(1)	34.57	0.0001	0.0214
Little Choptank River	(1)	14.36	0.0002	0.0138
Patuxent River	(1)	12.11	0.0006	0.0127
Nanticoke - Wicomico Rivers	(1)	5.57	0.0194	0.0086

[a] Parameter estimates and test statistics are shown for individual survey areas only if significantly different ($p<.05$) from zero. Since the effect of SAV was not significant (0.05 level), it was not included in the above analysis.

TABLE 13. RESULTS OF TESTING THE HYPOTHESIS THAT MARYLAND SURVEY AREA POPULATIONS OF BLACK DUCKS ARE RELATED TO THE DISTRIBUTION AND ABUNDANCE OF SAV, AND THE GENERAL ABUNDANCE (ATLANTIC FLYWAY POPULATION) OF THE SPECIES

Source[a]	df	F value	p>F	Parameter estimate
SAV * Survey area	22	7.65	0.0001	
Chester River	(1)	126.56	0.0001	2.988
Honga River	(1)	9.24	0.0028	0.6780
Bloodsworth - South Marsh Islands	(1)	12.74	0.0005	0.6218
Lower Choptank River	(1)	4.71	0.0312	0.2958
Patapsco River - Aberdeen P.G.	(1)	5.43	0.0213	-1.391
Flyway * Survey area	24	4.55	0.0001	
Patapsco River - Abderdeen P.G.	(1)	9.67	0.0022	0.0091
Manokin, Annemessex Rivers	(1)	15.13	0.0001	0.0074
Nanticoke - Wicomico Rivers	(1)	29.81	0.0001	0.0051
Patuxent River	(1)	7.95	0.0054	0.0046
Upper Choptank River	(1)	13.25	0.0004	0.0042
Chester River	(1)	17.14	0.0001	-0.0123

[a] Parameter estimates and test statistics are shown for individual survey areas only if significantly different ($p<.05$) from zero.

TABLE 14. RESULTS OF TESTING THE HYPOTHESIS THAT MARYLAND SURVEY AREA POPULATIONS OF MALLARDS ARE RELATED TO THE DISTRIBUTION AND ABUNDANCE OF SAV, AND THE GENERAL ABUNDANCE (ATLANTIC FLYWAY POPULATION) OF THE SPECIES

Source[a]	df	F value	p>F	Parameter estimate
SAV * Survey area	22	2.18	0.0029	
Chester River	(1)	41.47	0.0001	2.747
Flyway * Survey area	24	2.95	0.0001	
Wye River	(1)	7.84	0.0056	0.0138
Bayshore, Kent County	(1)	30.80	0.0001	0.0115
Patuxent River	(1)	3.92	0.0496	0.0065
Upper Choptank River	(1)	6.35	0.0125	0.0056
Nanticoke - Wicomico Rivers	(1)	6.55	0.0115	0.0051
Northeast - Elk - Bohemia Rivers	(1)	3.92	0.0494	0.0044

[a] Parameter estimates and test statistics are shown for individual survey areas only if significantly different ($p<.05$) from zero.

abundance of SAV (Table 15). The relationship (0.3 birds/ha of SAV) was less pronounced than in the puddle ducks examined, but more important than general species abundance in these areas. Population variation in other important bufflehead areas, such as the lower Choptank and Little Choptank Rivers, simply reflected changes in general abundance.

We demonstrated earlier that the food habits of canvasbacks in Chesapeake Bay changed during the 1970's more than any other species examined. Canvasbacks now feed extensively on small (<25 mm) Baltic macoma clams and other invertebrates and infrequently on SAV. When we analyzed current distribution and abundance of canvasbacks, we found no relationship with distribution and abundance of SAV (Table 16). We did find a significant intercept (1,910 birds), which is common to all areas, that estimates a population level independent of SAV or species abundance. If the area-specific effect of general abundance is not significant, then that area's population is estimated by the intercept. However if it is significant, the product of the area's parameter estimate and the Flyway population in a given year is added to the intercept. Estimated canvasback populations in areas listed under "Flyway x Survey area" in Table 16 are therefore greater or less than 1,910 birds.

Maryland populations of scaup and common goldeneyes also were not related to the distribution and abundance of SAV. Interpretation of our analysis of scaup populations (Table 17) is complicated somewhat by the large, negative intercept (-2,551 birds). This was primarily caused by extrapolating beyond the range of the data. Although area populations should be small during years when scaup are relatively scarce, a straight line fit yielded a negative intercept. However, a model that

TABLE 15. RESULTS OF TESTING THE HYPOTHESIS THAT MARYLAND SURVEY AREA POPULATIONS OF BUFFLEHEADS ARE RELATED TO THE DISTRIBUTION AND ABUNDANCE OF SAV, AND THE GENERAL ABUNDANCE (ATLANTIC FLYWAY POPULATION) OF THE SPECIES

Source[a]	df	F value	p>F	Parameter estimate
SAV * Survey area	22	2.14	0.0037	
Manokin, Annemessex Rivers	(1)	30.25	0.0001	0.3614
Eastern Bay	(1)	4.93	0.0279	0.3398
Flyway * Survey area	24	2.38	0.0007	
Lower Choptank River	(1)	5.52	0.0199	0.0138
Little Choptank River	(1)	14.75	0.0002	0.0136
Patuxent River	(1)	9.24	0.0028	0.0118
Bayshore, Calvert County	(1)	12.89	0.0004	0.0098
Honga River	(1)	4.62	0.0333	0.0072

[a] Parameter estimates and test statistics are shown for individual survey areas only if significantly different ($p<.05$) from zero.

TABLE 16. RESULTS OF TESTING THE HYPOTHESIS THAT MARYLAND SURVEY AREA POPULATIONS OF CANVASBACKS ARE RELATED TO THE DISTRIBUTION AND ABUNDANCE OF SAV, AND THE GENERAL ABUNDANCE (ATLANTIC FLYWAY POPULATION) OF THE SPECIES

Source[a]	df	F value	p>F	Parameter estimate
Intercept	1	7.02	0.0087	1910.
Flyway * Survey area	24	10.17	0.0001	
Patuxent River	(1)	22.85	0.0001	0.0335
Lower Choptank River	(1)	14.59	0.0002	0.0268
Magothy - Severn Rivers	(1)	7.39	0.0071	0.0191
South River - Herring Bay	(1)	4.71	0.0312	0.0152
Susquehanna Flats	(1)	4.53	0.0347	-0.0149
Northeast - Elk - Bohemia Rivers	(1)	4.49	0.0356	-0.0148
Sassafras River	(1)	4.49	0.0356	-0.0148
Bayshore, Kent Island	(1)	4.16	0.0427	-0.0143

[a] Parameter estimates and test statistics are shown for individual survey areas only if significantly different ($p<.05$) from zero. Since the effect of SAV was not significant (0.05 level), it was not included in the above analysis.

TABLE 17. RESULTS OF TESTING THE HYPOTHESIS THAT MARYLAND SURVEY AREA POPULATIONS OF SCAUP ARE RELATED TO THE DISTRIBUTION AND ABUNDANCE OF SAV, AND THE GENERAL ABUNDANCE (ATLANTIC FLYWAY POPULATION) OF THE SPECIES

Source[a]	df	F value	p>F	Parameter estimate
Intercept	1	4.71	0.0314	-2551.
Flyway * Survey area	24	2.87	0.0001	
Fishing Bay	(1)	49.84	0.0001	0.0280
Magothy - Severn Rivers	(1)	13.47	0.0003	0.0146
Chester River	(1)	8.07	0.0049	0.0113
South River - Herring Bay	(1)	7.08	0.0084	0.0106
Bayshore, Kent Island	(1)	4.75	0.0302	0.0087
Patuxent River	(1)	4.75	0.0302	0.0087
Patapsco River - Aberdeen P.G.	(1)	4.54	0.0343	0.0085
Bayshore, Calvert County	(1)	4.08	0.0449	0.0080

[a] Parameter estimates and test statistics are shown for individual survey areas only if significantly different ($p<.05$) from zero. Since the effect of SAV was not significant (0.05 level), it was not included in the above analysis.

includes an intercept (if significant) better explains the variation in area populations than does one without an intercept. Scaup populations in areas not listed in Table 17 are essentially very low, or at least not affected by general species abundance.

Although our analysis of common goldeneye populations led to the same conclusion (i.e., no SAV relationship), interpretation of results shown in Table 18 is simpler. Goldeneyes are uncommon in most survey areas, but relatively common and responsive to general abundance in areas such as Eastern Bay and the lower Choptank River.

We examined scoter or sea duck populations in Maryland with the same set of models, since these birds contrast greatly with other waterfowl in food and habitat preferences. As anticipated, we found no relationship between distribution and abundance of SAV and scoters. Small populations of these birds are widely scattered around the Bay (significant intercept), and concentrated in only a few areas such as the lower Choptank and Chester Rivers (Table 19).

We conclude that populations of wigeon, pintails, and redheads, all predominantly vegetarian in food preferences, declined to very low numbers in Maryland during the 1970's as a direct result of the SAV decline. Although swan populations showed a response to the level of SAV in a few important areas, black ducks and mallards were generally more affected. Diving ducks as a group showed little relationship if any to the distribution and abundance of SAV.

The distribution of waterfowl populations among survey areas indicates that a few areas are consistently among the most important to the various species examined. The Chester River, Eastern Bay, and lower Choptank River, which are among the four most abundantly vegetated

TABLE 18. RESULTS OF TESTING THE HYPOTHESIS THAT MARYLAND SURVEY AREA POPULATIONS OF COMMON GOLDENEYES ARE RELATED TO THE DISTRIBUTION AND ABUNDANCE OF SAV, AND THE GENERAL ABUNDANCE (ATLANTIC FLYWAY POPULATION) OF THE SPECIES

Source[a]	df	F value	p>F	Parameter estimate
Flyway * Survey area	24	4.98	0.0001	
Eastern Bay	(1)	60.06	0.0001	0.0410
Lower Choptank River	(1)	21.34	0.0001	0.0245
Patuxent River	(1)	18.92	0.0001	0.0230
Chester River	(1)	5.06	0.0255	0.0119
Bayshore, Kent Island	(1)	4.20	0.0416	0.0109

[a] Parameter estimates and test statistics are shown for individual survey areas only if significantly different ($p<.05$) from zero. Since the effect of SAV was not significant (0.05 level), it was not included in the above analysis.

TABLE 19. RESULTS OF TESTING THE HYPOTHESIS THAT MARYLAND SURVEY AREA POPULATIONS OF SCOTERS ARE RELATED TO THE DISTRIBUTION AND ABUNDANCE OF SAV, AND THE GENERAL ABUNDANCE (ATLANTIC FLYWAY POPULATION) OF THE SPECIES

Source[a]	df	F value	p>F	Parameter estimate
Intercept	1	4.66	0.0324	234.5
Flyway * Survey area	24	5.53	0.0001	
Lower Choptank River	(1)	61.62	0.0001	0.0286
Chester River	(1)	23.81	0.0001	0.0177
Eastern Bay	(1)	16.89	0.0001	0.0149
Patuxent River	(1)	12.11	0.0006	0.0126

[a] Parameter estimates and test statistics are shown for individual survey areas only if significantly different ($p<.05$) from zero. Since the effect of SAV was not significant (0.05 level), it was not included in the above analysis.

areas, are equally important as waterfowl wintering areas. We interpret this as additional evidence of a relationship between the distribution of waterfowl and SAV.

IMPACTS OF WATERFOWL ON SAV

Prior to this point we have attempted to clarify relationships between SAV as food resources and waterfowl as consumers. Our objective here is to evaluate the possibility that Chesapeake Bay waterfowl populations are in any way responsible for recent declines in distribution and abundance of submerged aquatic vegetation.

We are reminded, first of all, that waterfowl wintered in Chesapeake Bay long before recorded history. Populations of these birds, which have consumed SAV in the Bay for centuries without adverse impact, can be examined only during the last 25-30 years. Maryland waterfowl populations with one exception were larger during the early 1950's when SAV was certainly more abundant as well. The Canada goose population was the exception, as it began to increase during the mid-1950's when the mechanization of agriculture increased the availability of unharvested cereal grains.

We showed that distributions of waterfowl species populations in Maryland were generally stable prior to the 1970's. We showed further that three areas, the Chester River, Eastern Bay, and the lower Choptank River, consistently wintered the highest proportions of Maryland's waterfowl populations during both long-term and current periods. We conclude that 1) these populations most likely reflect greater abundance of SAV in these areas compared to other areas, and 2) since these areas continue to winter most of the waterfowl and produce most of the SAV, these birds cannot be responsible for recent declines in their food resources.

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APPENDIX TABLE A-1. SCIENTIFIC AND COMMON NAMES OF ANIMAL AND PLANT FOOD ITEMS OF CHESAPEAKE BAY WATERFOWL

Animal food items		Plant food items	
	undetermind animal		woody bark fragments
	undetermined fish		undetermined vegetation
Acrididae (Locustidae)	short-horned grasshopper	Abutilon Theophrasti	velvet-leaf (pie-marker)
Aedes sollicitans	salt marsh mosquito	Acalypha rhomboidea	three-seeded mercury
Aedes spp.	mosquito	Acalypha spp.	three-seeded mercury
Aeschnidae	darner	Acnida cannabinus (amaranthus)	tidemarsh waterhemp
Amara spp.		Agrostemma Githago	corn-cockle
Amnicola limosa		Aizoaceae	carpet-weed
Amnicola spp.	amnicola	Albizia Julibrissin	acacia (silk-tree)
Amnicoliidae (Bulimidae)	swamp snail	Alisma Plantago-aquatica	broadleaf waterplantain
Amphipoda	scud, sideswimmer	Alismataceae	water-plantain
Amygdulum papyria (Volsella)	paper mussel	Allium vineale	field garlic (scallion)
Anachis avara	greedy dove shell	Alnus serrulata	smooth alder
Anculosa spp.	river snail	Amaranthaceae	amaranth
Ancylidae	limpet	Amaranthus hybridus	prince's feather
Anguilla rostrata	American eel	Amaranthus spp.	amaranth
Anguilla spp.	eel	Ambrosia artemisiifolia	ragweed
Anguillidae	eel	Ambrosia spp.	ragweed
Anisoptera	dragonfly	Ambrosia trifida	ragweed
Annelida	leech, polychaete	Ampelopsis arborea	pepper-vine
Anodonta grandis		Ampelopsis spp.	
Anodonta imbecilis		Anacardiaceae	cashew
Anthribidae	fungus weevil	Andropogon spp.	beard grass
Anthuridae	aquatic sowbug	Andropogon Gerardi	beard grass
Aoridae		Aneilema Keisak	marsh day-flower
Apeltes quadracus		Aquifoliaceae	holly
Aphidae	aphid, plantlice	Araceae	arum
Aphodius spp.	dung beetle	Arthraxon hispidus	grass
Arachnida		Aster puniceus	wild aster
Araneae	spider	Aster spp.	aster
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	Aster tenuifolius	
Arthropoda		Atriplex patula	spearscale
Ascidiacea		Avena fatua	wild oat
Asellidae	aquatic sowbug	Avena sativa	oats
Asellus spp.		Baccharis halimifolia	groundsel tree
Astacidae	crayfish	Berchemia scandens	supple-jack
Atherinidae		Betula nigra	river birch (red birch)
Atheta spp.		Bidens laevis	beggar-tick
Bairdiella chrysura	silver perch	Bidens spp.	beggar-tick
Balanidae	rock barnacle	Boehemeria cylindrica	false nettle
Balanus eburneus	ivory barnacle	Brasenia Schreberi	watershield
Balanus improvisus	bay barnacle	Bromus secalinus	cheat (chess)
Balanus spp.	barnacle	Butomaceae	flowering rush
Batrachoididae	toadfish	Butomus umbellatus	flowering rush
Belastoma spp.		Caprifoliaceae	honeysuckle
Belastomidae	giant water bug	Carex crinita	sedge

(continued)

APPENDIX TABLE A-1. (continued)

Animal food items		Plant food items	
Berosus spp.		Carex festucacea	sedge
Bethylidae	bethylid	Carex hormathodes	sedge
Bidessus spp.		Carex hyalinolepis	lake sedge
Bittium alternatum (B. nigrum)	alternate bittium	Carex intumescens	
Bittium spp.		Carex lupilina	sedge
Bittium varium	variable bittium	Carex lurida	sedge
Bolesoma nigrum (Ethesoma)		Carex scoparia	sedge
Brachiodontes recurvus (Mytilus)	hooked mussel	Carex spp.	sedge
Brevoortia tyrannus	Atlantic menhaden	Carex stricta	sedge
Bryozoa (Ectoprocta)		Carpinus caroliniana	hornbeam (blue beech)
Callinectus sapidus	blue crab	Carya spp.	hickory
Calyptraeidae	cup and saucer limpet	Caryophyllaceae	pinks
Cambarus diogenes		Cassia fasciculata	partridge-pea (locust-weed)
Campeloma decisum		Cassia spp.	senna
Campeloma integrum		Celtis occidentalis	hackberry
Campeloma spp.		Celtis spp.	elm
Cancer borealis	northern crab	Centella erecta (asiactica)	parsley
Cancridae		Cephalanthus occidentalis	buttonbush
Canthydrus puncticollis		Ceratophyllaceae	hornwort
Carabidae	ground beetle	Ceratophyllum demersum	hornwort
Caralsidae		Chara spp.	muskgrass
Cardiidae	cockle	Characeae	muskgrass
Cassidinidea lunifrons		Charophyceae	muskgrass, stonewort
Centrarchidae		Chenopodiaceae	goosefoot
Ceratopogonidae	biting midge, punky	Chenopodium album	lamb's quarters
Cerithiidae	horn shell	Chenopodium spp.	goosefoot
Cerithiopsidae		Chlorophyceae	green algae
Cerithopsis spp.	cerith	Cicuta maculata	water-hemlock
Chalepus dorsalis		Cicuta spp.	water-hemlock
Cheilostomata		Cladium jamaicense	sawgrass
Chilognatha		Cladium mariscoides	twig-rush
Chiridotea caeca	isopod	Cladium spp.	
Chironomidae	midge	Cladophora spp.	green algae
Chordata		Cladophoraceae	
Chrysomelidae	leaf beetle	Commelina communis	day-flower
Cicadellidae	leafhopper	Commelina virginica	day-flower
Cladocera	water flea	Commelinaceae	spiderwort
Clupeidae	herring	Compositae	composite
Coelambus spp.		Convolvulaceae	morning glory, convolvulus
Coelenterata (Cnidaria)	hydroid, jellyfish	Cornaceae	dogwood
Coleophoridae	casebearer	Cornus florida	flowering dogwood
Coleoptera	beetle	Cornus spp.	dogwood
Congeria leucophaeta	Conrad's false mussel	Cornus stolonifera	red osier
Copelatus glyphicus	diving beetle	Cornus Amomum	dogwood
Copepoda	copepod	Corylaceae	hazel
Corbicula fluminea		Crataegus spp.	hawthorn

(continued)

APPENDIX TABLE A-1. (continued)

Animal food items		Plant food items	
Corbicula manilensis	Asiatic fresh-water clam	Crotolaria spectabilis	rattlebox
Corbiculiidae (Cyrenidae)	marsh clam	Cuscuta spp.	dodder
Corixidae	water boatman	Cynodon Dactylon	bermuda grass (wire grass)
Corophiidae	scud, sideswimmer	Cyperaceae	sedge
Corophium spp.	amphipod	Cyperus albomarginatus	galingale
Crangon spp.	sand shrimp	Cyperus erythrorhizos	redroot cyperus
Crangonidae	pistol shrimp	Cyperus esculentus	galingale
Crangonyx spp.	amphipod	Cyperus filicinus	galingale
Crepidula convexa	convex slipper shell	Cyperus flavescens	galingale
Crepidula fornicata	common slipper shell	Cyperus odorattes	galingale
Crepidula spp.	slipper shell	Cyperus rotundus	galingale
Cristatella mucedo		Cyperus spp.	galingale
Crustacea	crustacean	Cyperus strigosus	galingale
Culicidae	mosquito	Cyperus Iria	galingale
Culicoides spp.	punky	Datura stramonium	jimson-weed
Cumacea		Decodon verticillatus	water-willow
Curculionidae	snout beetle	Digitaria filiformis	crab grass
Cyathura carinata (polita)	isopod	Digitaria sanguinalis	crab grass
Cyathura polita	isopod	Digitaria spp.	crab grass
Cyathura spp.	isopod	Digitaria Ischaemum	crab grass
Cydepistonus castaneus		Diodia teres	buttonweed
Cypridae	seed shrimp	Dioscoreaceae	yam
Cyprinidae	minnow	Discorea quaternata	wild yam
Cyprinodon variegatus	sheepshead minnow	Discorea villosa	wild yam
Cyprinodontidae	top minnow	Distichlis spicata	salt grass
Cypris spp.	seed shrimp	Echinochloa colonum	jungle rice
Cyrenoida floridana (Cyrenella)		Echinochloa crusgalli	barnyard grass
Cyrenoididae (Cyrenellidae)	clam, mussel	Echinochloa spp.	
Daphnia spp.	water flea	Echinochloa Walteri	
Daphnidae	water flea	Eclipta alba	composite
Decapoda	crayfish, shrimp	Eleocharis obtusa	blunt spikerush
Dermaptera	earwig	Eleocharis olivacea	spikerush
Diplopoda	milliped	Eleocharis palustris	common spikerush
Diptera	fly	Eleocharis parvula	dwarf spikerush
Dolomedes spp.	fishing spider	Eleocharis quadrangulata	squarestem spikerush
Donacia spp.	long-horned leaf beetle	Eleocharis spp.	spikerush
Doru lineare		Eleocharis Engelmanni	
Dreissenidae	false mussel	Eleusine indica	yard grass
Dytiscidae	predaceous diving beetle	Elodea canadensis	common elodea
Dytiscus spp.	predaceous diving beetle	Elodea spp.	
Edotea spp.		Enteromorpha clathrata	filamentous green alga
Edotea triloba	isopod	Enteromorpha intestinalis	green alga
Elateridae	click beetle	Enteromorpha spp.	filamentous green algae
Electra crustulenta	lacy crust	Eulalia viminea	
Elliptio complanata (Unio)		Euphorbia spp.	spurge
Elliptio spp.		Euphorbiaceae	spurge

(continued)

APPENDIX TABLE A-1. (continued)

Animal food items		Plant food items	
Enochrus spp.		Fagaceae	beech
Ephemeridae	burrowing mayfly	Festuca elatior	meadow fescue
Ephemeroptera	mayfly	Festuca spp.	
Epitoniidae	wentletrap	Fimbristylis castanea	saltmarsh fimbristylis
Epitonium rupicola	lined wentletrap	Fimbristylis spp.	saltmarsh fimbristylis
Erichsonella attenuata	isopod	Fraxinus americana	white ash
Erichsonella spp.	isopod	Fuirena spp.	fuirena
Eros spp.		Galium spp.	bedstraw, cleavers
Euparius marmoreus		Geraniaceae	geranium
Eurypanopeus depressus	mud crab	Geranium spp.	wild geranium
Forficulidae	common earwig	Gerardia maritima	seaside gerardia
Formicidae	ant	Glyceria striata	manna grass
Fulgoridae	fulgorid planthopper	Glycine Max	soy bean
Fundulus heteroclites		Gracilaria spp.	red weed
Fundulus spp.		Gramineae	grasses
Galerucella spp.	leaf beetle	Haloragaceae	watermilfoil
Gammaridae	scud	Hamamelidaceae	witch-hazel
Gammarus fasciatus	scud	Hedeoma pulegoides	American pennyroyal
Gammarus mucronatus	scud	Helianthus spp.	sunflower
Gammarus palustris	scud	Heteranthera dubia	water star-grass
Gammarus spp.	scud	Hibiscus Moscheutos	rose-mallow
Gammarus tigrinus	scud	Hordeum vulgare	barley
Gasterosteidae		Hydrocharitaceae	frog-bit
Gasterosteus aculeatus		Ilex decidua	holly
Gastropoda	snail, limpet	Ilex laevigata	winterberry
Gelastocoridae	toad bug	Ilex opaca	American holly
Gemma gemma	gem clam	Ilex spp.	holly
Gerridae	water strider	Ilex verticillata	black alder (winterberry)
Gillia altilis	snail	Ipomoea hederacea	morning glory
Gobiidae	goby	Iridaceae	iris
Gobiosoma bosci	goby	Iris Pseudacorus	water-flag
Gobiosoma spp.	naked goby	Iva frutescens	marsh-elder
Goniobasis spp.	snail	Juglandaceae	walnut
Goniobasis virginica	snail	Juncaceae	rush
Graphoderes spp.		Juncus spp.	rush
Graphops pulsescens		Juncus Roemerianus	needlerush
Grapsidae		Juniperus virginiana	red cedar
Gryllidae	cricket	Labiatae	mint
Gryllotalpa	northern mole cricket	Leersia oryzoides	cut grass
Gyralus deflectus		Leersia virginica	white grass
Gyralus parvus (Planorbis)	fresh water snail	Leguminosae	pulse
Gyralus spp. (Planorbis spp.)		Lemna minor	
Gyrinidae	whirligig beetle	Lemnaceae	duckweed
Haliplidae	crawling water beetle	Leptochloa fascicularis	
Heliosoma antrosa (Planorbis)		Lespedeza bicolor	pulse
Heliosoma spp. (Planorbis spp.)	orb snail	Lespedeza spp.	bush-clover

(continued)

APPENDIX TABLE A-1. (continued)

Animal food items		Plant food items	
Heliosoma trivolvis	fresh water snail	Lespedeza stipulacea	Korean lespedeza
Hemiptera	true bug	Lespedeza striata	Japanese clover
Heptageniidae	stream mayfly	Liliaceae	lily
Hexagenia bilineata	mayfly	Limonium spp.	sea-lavender
Hexagenia spp.	mayfly	Lippia lanceolata	fog-fruit
Hexapaneopeus angustifrons	mud crab	Lippia spp.	fog-fruit
Hirudinea	leech	Liquidambar styraciflua	sweet gum (red gum)
Homoptera	cicada, hopper, aphid	Liriodendron tulipifera	tulip tree (yellow poplar)
Hyalella spp.	amphipod	Lolium perenne	English rye grass
Hydracarina (Acarina)	mite	Lolium spp.	rye grass
Hydrachna spp.	freshwater mite	Ludwigia palustris	marsh-purslane
Hydrachnidae	freshwater mite	Lycopus uniflorus	bugle-weed
Hydrobia spp. (Littoridinops)	swamp snail	Lythraceae	loosestrife
Hydrobiidae		Magnolia virginiana	sweet bay (swamp bay)
Hydrophilidae	water scavenger beetle	Magnoliaceae	magnolia
Hydrophilus spp.	water scavenger beetle	Malvaceae	mallow
Hydrozoa	hydroid	Medicago lupulina	black medick
Hymenoptera	bee, wasp, ant	Melilotus spp.	sweet clover
Ichneumonidae	ichneumonid	Mollugo verticilliata	carpet-weed
Ictaluridae	catfish	Muhlenbergia frondosa	muhly
Idoteidae	aquatic sowbug	Muhlenbergia spp.	
Insecta	insect	Myrica carolinensis	wax-myrtle
Isopoda	isopod	Myrica cerifera	wax-myrtle
Laevicardium mortoni	Morton's cockle	Myrica pensylvanica	bayberry
Lasius spp.	field ant	Myrica spp.	wax-myrtle
Lepadidae	goose barnacle	Myricaceae	wax-myrtle
Lepas spp.	goose barnacle	Myriophyllum oxalbescens	watermilfoil
Lepidoptera	butterfly, moth	Myriophyllum spp.	watermilfoil
Lepomis gibbosus	bluegill	Myriophyllum spicatum	Eurasian watermilfoil
Lepomis macrochirus	bluegill	Nadaceae	naiad
Lepomis spp.	bluegill	Najas flexilis	northern naiad
Leptinotarsa decemlineata	Colorado potato beetle	Najas guadalupensis	southern naiad
Leptocheirus plumulosus	amphipod	Najas marina	naiad
Leptochelia savigny		Najas spp.	naiad
Libelluidae	common skimmer	Nitella spp.	nitella
Littorina irrorata	marsh periwinkle	Nuphar advena	yellow water lily
Littorinidae	periwinkle	Nymphaea odorata (Castalia)	white water lily
Lophopodidae	bryozoan	Nymphaeaceae	water lily
Lora spp.	lora	Nyssa aquatica	sour gum
Lumbricidae		Nyssa biflora	water gum
Lycidae	net-winged beetle	Nyssa spp.	sour gum
Lycosa spp.	wolf spider	Nyssa sylvatica (biflora)	black gum (sour gum)
Lycosidae	wolf spider	Nyssaceae	sour gum
Lygaedidae	seed bug	Oleaceae	olive
Lymnaea columella		Onagraceae	evening primrose
Lymnaeidae		Panicum anceps	panic grass

(continued)

APPENDIX TABLE A-1. (continued)

Animal food items		Plant food items	
Lyrogyrus puporideus	snail	Panicum capillare	witch grass
Lyrogyrus spp.	snail	Panicum clandestinum	
Macoma balthica	Baltic macoma	Panicum dichotomiflorum	panic grass
Macoma mitchelli (M. phenax)	Mitchell's clam	Panicum spp.	panic grass
Macoma tenta	narrowed macoma	Panicum verrucosum	panic grass
Mactra spp. (Spisula spp.?)	(winged?) surf clam	Panicum virgatum	panic grass
Mactridae	surf clam	Paspalum ciliatifolium	
Melampidae	salt marsh snail	Paspalum laeve	grass
Melampus bidentatus	salt marsh snail	Paspalum spp.	grass
Melanella spp. (Eulima)	snail	Peltandra virginica	arrow arum
Melanellidae	snail	Pennisetum spp.	feathertop
Membranipora spp.	bryozoan	Phaseolus vulgaris	common bean
Membraniporidae	bryozoan	Phytolacca americana	pokeweed
Menidia spp.	silverside	Phytolaccaceae	pokeweed
Microciona prolifera	red sponge	Pinaceae	pine
Microcionidae	sponge	Pinus spp.	pine
Mitrella lunata	crescent mitrella	Pinus Taeda	loblolly pine
Mitrella spp.	mitrella	Plantaginaceae	plantain
Modiolus plicatulis	mussel	Plantago lanceolata	English plantain
Modiolus spp. (Volsella)	mussel	Plantago spp.	plantain
Molgula manhattensis	sea grape	Plumbaginaceae	leadwort
Molgula spp.	sea grape	Polygonaceae	buckwheat
Mollusca	mollusk	Polygonum amphibium	smartweed
Mulinia lateralis	duck clam	Polygonum arifolium	halberdleaf tear-thumb
Muricidae	rock shell	Polygonum aviculare	
Mya arenaria	soft-shelled clam	Polygonum coccineum	marsh smartweed
Myacidae	soft-shelled clam	Polygonum densiflorum	southern smartweed
Myrmica spp.	ant	Polygonum hydropiperoides	swamp smartweed
Mytilidae	mussel	Polygonum lapathifolium	nodding smartweed
Mytilus edulis	blue mussel	Polygonum pensylvanicum	smartweed
Nalsidae		Polygonum punctatum	dotted smartweed
Nassariidae (Nassidae)	dog whelk	Polygonum sagittatum	smartweed
Nassarius obsoletus (Nyanassa)	mud dog whelk	Polygonum scandens	false buckwheat
Nassarius spp.	dog whelk	Polygonum spp.	smartweed
Nassarius trivittatus (Nassa)	New England dog whelk	Polygonum virginianum (Tovara)	
Nassarius vibex	mottled dog whelk	Polygonum Hydropiper	smartweed
Neopanope texana sayi	mud crab	Polygonum Persicaria	smartweed
Nereidae	clam worm	Polypodiaceae	fern
Nereis spp.	clam worm	Polystichum acrostichoides	christmas-fern
Nereis succinea	clam worm	Pontederia cordata	pickerel weed (tuckahoe)
Neuroptera	alderfly, dobsonfly	Pontederiaceae	pickerel weed
Notropis spp.	shiner	Portulaca oleracea	purslane
Nucula proxima	near nut shell	Portulaca spp.	purslane
Nuculidae	nut shell	Portulacaceae	purslane
Nysius spp.		Potamogeton amplifolius	bigleaf pondweed
Odonata	dragonfly, damselfly	Potamogeton berchtoldi	slender pondweed

(continued)

APPENDIX TABLE A-1. (continued)

Animal food items		Plant food items	
Odontomyia spp.		Potamogeton crispus	curly pondweed
Odostomia impressa	incised odostome	Potamogeton epihydrus	ribbonleaf pondweed
Odostomia spp.	odostome	Potamogeton foliosus	leafy pondweed
Odostomia trifida	tripartite odostome	Potamogeton gramineus	variable pondweed
Oligochaeta	aquatic earthworm	Potamogeton natans	floating pondweed
Opsanus tau	oyster toadfish	Potamogeton nodosus (americanus)	longleaf pondweed
Orchestia agilis	amphipod	Potamogeton pectinatus	sago pondweed
Orchestia spp.	amphipod	Potamogeton perfoliatus	redhead grass
Orthoptera	grasshopper, cricket	Potamogeton pusillus	slender pondweed
Ovalipes ocellatus	lady crab	Potamogeton spp.	pondweed
Palaemonetes pugio	prawn	Proserpinaca palustris	marsh mermaidweed
Palaemonetes spp.	grass shrimp	Prunella vulgaris	self-heal
Palaemonetes vulgaris	common prawn	Prunus serotina	wild cherry (black cherry)
Palaemonidae	prawn and shrimp	Prunus virginiana	choke-cherry
Paneopeus herbstii	mud crab	Quercus palustris	pin-oak
Paneopeus spp.	mud crab	Quercus spp.	oak
Pectinatella magnifica	bryozoan	Quercus Phellos	willow-oak
Pelecypoda (Bivalvia)	bivalve	Ranunculaceae	crowfoot
Pentatomidae	stink bug	Ranunculus acris	buttercup
Perca flavescens	yellow perch	Ranunculus bulbosus	buttercup
Percidae	perch	Ranunculus sceleratus	cursed crowfoot
Phyllophaga spp.	June beetle	Rhamnaceae	buckthorn
Physa heterostropha	snail	Rhodophyceae	red algae
Physa sayii	snail	Rhus glabra	smooth sumac
Physa spp.	snail	Rhus radicans	poison ivy - poison oak
Physidae	pouch snail	Rhus spp.	cashew
Phytonomus meles		Rhus Copallinum	sumac
Phytonomus nigrirostris	lesser clover leaf weevil	Rhus Toxicodendron	poison-oak
Pisauridae	fishing spider	Rhynchospora capitellata	beak-rush
Pisidium alsditum	fresh-water clam	Ricinus communis	castor-bean
Pisidium atlanticum	fresh-water clam	Robinia Psuedoacacia	black locust
Pisidium spp.	fresh-water clam	Rosa palustris	swamp rose
Pissodes nemorensis		Rosa spp.	rose
Planorbidae	orb snail	Rosaceae	rose
Pleurocera spp.	river snail	Rubiaceae	madder
Pleuroceridae	river snail	Rubus spp.	bramble
Pleurotomella spp. (Pleurotoma)	pleurotomella	Rumex crispus	sour dock
Plumatellina		Rumex obtusifolius	bitter dock
Podocopa	ostracod	Rumex spp.	dock, sorrel
Poeciliidae		Rumex verticilliatus	water-dock
Poecilosclerina		Rumex Acetosella	red sorrel
Pogonias cromis	black drum	Ruppia maritima	widgeongrass
Polistes spp.	paper wasp	Sagittaria latifolia	broadleaf arrowhead
Polychaeta	polychaete	Sagittaria rigida	bur arrowhead
Popillia japonica	Japanese beetle	Sagittaria spp.	arrowhead
Porifera	sponge	Salicornia Bigelovii (musronata)	glasswort (samphire)

(continued)

APPENDIX TABLE A-1. (continued)

Animal food items		Plant food items	
Portunidae	swimming crab	Sambucus canadensis	common-elder
Pyralidae	pyralid moths	Scirpus acutus (occidentalis)	hardstem bulrush
Pyramidella spp.	pyramid shell	Scirpus americanus	common threesquare
Pyramidellidae (Turbinellidae)	pyramid shell	Scirpus fluviatilis	river bulrush
Pyrenidae (Columbellidae)	dove shell	Scirpus pallidus	black bulrush
Rangia cuneata	brackish water clam	Scirpus purshianus (debilis)	bluntscale bulrush
Reduviidae	assassin bug	Scirpus robustus	saltmarsh bulrush
Retusa canaliculata (Acteocina)	channeled barrel bubble	Scirpus spp.	bulrush
Retusidae		Scirpus validus	softstem bulrush
Rhinomacer elongatus	snout beetle	Scirpus Olneyi	olney threesquare
Rhithropaneopeus harrisi	white-fingered mud crab	Scrophulariaceae	figwort
Rissoidae	risso	Secale cereale	rye
Sanguinolariidae	gari shell	Setaria geniculata	foxtail grass
Sayella chesapeakea	snail	Setaria glauca	foxtail grass
Scarabaeidae	scarab beetle	Setaria italica	millet
Sciaenidae		Setaria lutescens	foxtail grass
Sesmarma spp.		Setaria magna	giant setaria
Sialidae	alderfly	Setaria spp.	foxtail grass
Sialis spp.		Setaria viridis	foxtail grass
Sirthenia carinata		Setaria Faberii	foxtail grass
Sphaeridae	sphere shell	Smilax glauca	lily
Sphaerium spp.	sphere shell	Smilax rotundifolia	lily
Sphaerium striatinum		Smilax spp.	lily
Sphaerium transversum		Smilax Walteri	lily
Sphenophorus spp.	billbug	Solanaceae	nightshade
Staphylinidae	rove beetle	Solanum carolinense	horse-nettle
Stenolophus spp.		Solanum nigrum	black nightshade
Stratiomyidae	soldier fly	Sorgum halapense	Johnson grass
Systena elongata		Sorgum spp.	grass
Tabanidae	horsefly, deerfly	Sorgum vulgare	grass
Tachistodes spp.		Sparganiaceae	burreed
Tagelus plebeius	stout razor clam	Sparganium americanum	eastern burreed
Talitridae	beach flea	Sparganium androcladum	shining burreed
Tanaidae	aquatic sowbug	Sparganium eurycarpum	big burreed
Tellina spp.	dwarf tellin	Sparganium spp.	burreed
Tellinidae	tellin	Spartina alterniflora (stricta)	saltmarsh cordgrass
Tenebrionidae	darkling beetle	Spartina cynosuroides	big cordgrass
Thoracia	barnacle	Spartina patens	saltmeadow cordgrass
Tipulidae	crane fly	Spartina spp.	cordgrass
Trichoptera	caddisfly	Spirodela polyrhiza	big duckweed
Triliarthrus badiipennis		Stellaria media	chickweed (starwort)
Triphora nigrocincta (Triforis)	black triphora	Taxodium distichum	bald cypress
Triphoridae	left-handed snail	Teucrium canadense	germander (wood sage)
Tropisternus spp.		Trichostema spp.	blue curls
Turbinidae	turban shell	Trifolium repens	white clover
Turbo spp.		Triticum aestivum	wheat

(continued)

APPENDIX TABLE A-1. (continued)

Animal food items		Plant food items	
Turbonilla spp.	pyramid shell	Ulmaceae	elm
Turridae	turret shell	Ulva lactuca	sea lettuce
Unionidae	fresh water clam	Ulva spp.	sea lettuce
Urochordata (Tunicata)		Ulvaceae	sea lettuce
Urosalpinx cinerea	Atlantic oyster drill	Umbelliferae	parsley
Valvata tricarinata		Urticaceae	nettle
Valvatidae	round-mouth snail	Vallisneria americana (spiralis)	wildcelery
Veneridae	hard-shelled clam	Verbena urticifolia	vervain
Vespa spp.		Verbenaceae	vervain
Vespidae	paper wasp	Vicia spp.	vetch
Viviparus intertextus		Vigna sinensis	cow-pea
Xanthidae (Pilumnidae)	mud crab	Vitaceae	grape
Zygoptera	damselfly	Vitis aestivalis	summer-grape
		Vitis riparia	forest-grape
		Vitis spp.	grape, wild grape
		Vitis vulpina (cordifolia)	forest-grape
		Xanthium spp.	cocklebur
		Zannichellia palustris	horned pondweed
		Zea mays	corn
		Zizania aquatica	wildrice
		Zizaniopsis miliacea	southern wild rice
		Zostera marina	eelgrass
		Zosteraceae	pondweed

APPENDIX TABLE B-1. FOOD ITEMS OF WHISTLING SWANS IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

		Frequency occurrence			Aggregate percent[a]		
Scientific name	Common name	Gizzard (2)	Gullet (.)	Unknown (50)	Gizzard (2)	Gullet (.)	Unknown (50)
Mollusca	mollusk	.	.	6	.	.	0.1
Sayella chesapeakea	snail	.	.	2	.	.	0.0
Pelecypoda (Bivalvia)	bivalve	.	.	4	.	.	0.0
Macoma balthica	Baltic macoma	.	.	34	.	.	16.8
Macoma mitchelli (M. phenax)	Mitchell's clam	.	.	4	.	.	1.7
Mya arenaria	soft-shelled clam	.	.	28	.	.	6.4
Tagelus plebeius	stout razor clam	.	.	2	.	.	0.2
Polychaeta	polychaete	.	.	4	.	.	0.0
Nereis spp.	clam worm	.	.	12	.	.	0.0
Arthropoda		.	.	2	.	.	0.0
Isopoda	isopod	.	.	2	.	.	0.0
Cyathura carinata (polita)	isopod	.	.	4	.	.	0.0
Amphipoda	scud, sideswimmer	.	.	4	.	.	0.0
Decapoda	crayfish, shrimp	.	.	2	.	.	0.0
Ovalipes ocellatus	lady crab	.	.	2	.	.	0.0
	Total animal material	0	.	64	.	.	25.3
Rhodophyceae	red algae	.	.	4	.	.	0.0
Enteromorpha spp.	filamentous green algae	.	.	2	.	.	0.2
Potamogeton pectinatus	sago pondweed	.	.	22	.	.	6.2
Potamogeton perfoliatus	redhead grass	.	.	12	.	.	2.3
Sparganium eurycarpum	big burreed	.	.	2	.	.	0.0
Cladium mariscoides	twig-rush	.	.	2	.	.	0.0
Scirpus americanus	common threesquare	.	.	4	.	.	0.1
Scirpus Olneyi	olney threesquare	.	.	2	.	.	0.1
Scirpus robustus	saltmarsh bulrush	.	.	2	.	.	0.0
Zea mays	corn	.	.	10	.	.	6.1
Distichlis spicata	salt grass	.	.	2	.	.	1.0
Myrica spp.	wax-myrtle	.	.	2	.	.	0.0
Rumex spp.	dock, sorrel	.	.	2	.	.	0.0
Polygonum punctatum	dotted smartweed	.	.	2	.	.	0.1
Rhus Copallinum	sumac	.	.	2	.	.	0.0
Nyssa sylvatica (biflora)	black gum (sour gum)	.	.	4	.	.	0.8
Ceratophyllum demersum	hornwort	.	.	2	.	.	0.0
	undetermined vegetation	.	.	6	.	.	1.3
Ruppia maritima	widgeongrass	50	.	76	50.0	.	48.7
Vallisneria americana (spiralis)	wildcelery	50	.	6	49.5	.	5.9
Scirpus spp.	bulrush	50	.	2	0.5	.	1.9
	Total plant material	100	.	96	100.0	.	74.7

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-2. FOOD ITEMS OF RUDDY DUCKS IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

		Frequency occurrence			Aggregate percent[a]		
Scientific name	Common name	Gizzard (25)	Gullet (.)	Unknown (10)	Gizzard (25)	Gullet (.)	Unknown (10)
Bittium varium	variable bittium	.	.	10	.	.	0.1
Laevicardium mortoni	Morton's cockle	.	.	10	.	.	0.2
Mya arenaria	soft-shelled clam	.	.	30	.	.	7.5
Cyathura carinata (polita)	isopod	.	.	20	.	.	0.7
Chiridotea caeca	isopod	.	.	30	.	.	4.3
Gammarus mucronatus	scud	.	.	20	.	.	4.4
Macoma balthica	Baltic macoma	20	.	10	8.2	.	3.0
Retusa canaliculata (Acteocina)	channeled barrel bubble	8	.	40	5.6	.	4.3
Mulinia lateralis	duck clam	4	.	50	4.0	.	28.0
Macoma mitchelli (M. phenax)	Mitchell's clam	4	.	30	3.2	.	13.0
	undetermined fish	12	.	.	2.7	.	.
Tellina spp.	dwarf tellin	8	.	.	2.0	.	.
Amphipoda	scud, sideswimmer	4	.	10	2.0	.	1.5
Paneopeus herbstii	mud crab	4	.	.	1.6	.	.
Arthropoda		16	.	10	1.4	.	0.1
Chironomidae	midge	20	.	.	0.9	.	.
Crangon spp.	sand shrimp	4	.	.	0.6	.	.
Mollusca	mollusk	20	.	.	0.4	.	.
Gemma gemma	gem clam	4	.	.	0.4	.	.
Sayella chesapeakea	snail	8	.	30	0.3	.	0.4
Nereidae	clam worm	16	.	.	0.3	.	.
Gyralus parvus (Planorbis)	fresh water snail	4	.	.	0.2	.	.
Paneopeus spp.	mud crab	4	.	.	0.2	.	.
Trichoptera	caddisfly	12	.	.	0.2	.	.
Sialidae	alderfly	4	.	.	0.2	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	4	.	.	0.1	.	.
Hydrobia spp. (Littoridinops)	swamp snail	4	.	.	0.1	.	.
Pelecypoda (Bivalvia)	bivalve	4	.	.	0.1	.	.
Gyralus spp. (Planorbis spp.)		4	.	.	0.0	.	.
Elliptio spp.		4	.	.	0.0	.	.
Insecta	insect	8	.	.	0.0	.	.
Corixidae	water boatman	4	.	.	0.0	.	.
Myrmica spp.	ant	4	.	.	0.0	.	.
Gastropoda	snail, limpet	4	.	.	0.0	.	.
Nereis spp.	clam worm	4	.	.	0.0	.	.
Coleoptera	beetle	4	.	.	0.0	.	.
Scarabaeidae	scarab beetle	4	.	.	0.0	.	.
Enochrus spp.		4	.	.	0.0	.	.
Formicidae	ant	8	.	.	0.0	.	.
Anisoptera	dragonfly	12	.	.	0.0	.	.
Ephemeridae	burrowing mayfly	4	.	.	0.0	.	.
Hydrachnidae	freshwater mite	4	.	.	0.0	.	.

(continued)

APPENDIX TABLE B-2. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (25)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (10)	Aggregate percent[a] Gizzard (25)	Aggregate percent[a] Gullet (.)	Aggregate percent[a] Unknown (10)
Porifera	sponge	4	.	.	0.0	.	.
Bryozoa (Ectoprocta)		8	.	.	0.0	.	.
Coelenterata (Cnidaria)	hydroid, jellyfish	4	.	.	0.0	.	.
	Total animal material	80	.	80	34.8	.	67.5
Nyssa sylvatica (biflora)	black gum (sour gum)	.	.	20	.	.	0.9
Vallisneria americana (spiralis)	wildcelery	24	.	.	21.3	.	.
Scirpus Olneyi	olney threesquare	24	.	20	10.4	.	0.5
Zea mays	corn	12	.	30	8.7	.	19.3
Ruppia maritima	widgeongrass	28	.	20	8.3	.	0.5
	undetermined vegetation	36	.	10	5.3	.	1.0
Potamogeton pectinatus	sago pondweed	8	.	.	2.5	.	.
Polygonum hydropiperoides	swamp smartweed	4	.	.	2.4	.	.
Agrostemma Githago	corn-cockle	12	.	.	1.9	.	.
Paspalum spp.	grass	4	.	.	1.4	.	.
Potamogeton spp.	pondweed	20	.	.	0.8	.	.
Potamogeton perfoliatus	redhead grass	8	.	20	0.5	.	2.8
Potamogeton pusillus	slender pondweed	8	.	10	0.4	.	0.5
Najas guadalupensis	southern naiad	4	.	10	0.4	.	7.0
Avena fatua	wild oat	4	.	.	0.3	.	.
Scirpus validus	softstem bulrush	8	.	.	0.1	.	.
Gramineae	grasses	8	.	.	0.1	.	.
Cladium mariscoides	twig-rush	4	.	.	0.1	.	.
Scirpus robustus	saltmarsh bulrush	4	.	10	0.1	.	0.0
Carex spp.	sedge	8	.	.	0.1	.	.
Chara spp.	muskgrass	4	.	.	0.0	.	.
Scirpus spp.	bulrush	4	.	.	0.0	.	.
Distichlis spicata	salt grass	4	.	.	0.0	.	.
Sambucus canadensis	common-elder	4	.	.	0.0	.	.
Eleocharis palustris	common spikerush	4	.	.	0.0	.	.
Panicum spp.	panic grass	4	.	.	0.0	.	.
Myrica cerifera	wax-myrtle	4	.	.	0.0	.	.
Polygonum punctatum	dotted smartweed	4	.	.	0.0	.	.
Myriophyllum spp.	watermilfoil	4	.	.	0.0	.	.
Cuscuta spp.	dodder	4	.	.	0.0	.	.
	Total plant material	88	.	90	65.2	.	32.5

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-3. FOOD ITEMS OF BUFFLEHEADS IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

		Frequency occurrence			Aggregate percent[a]		
Scientific name	Common name	Gizzard (6)	Gullet (.)	Unknown (20)	Gizzard (6)	Gullet (.)	Unknown (20)
Rissoidae	risso	.	.	10	.	.	0.1
Sayella chesapeakea	snail	.	.	5	.	.	0.0
Odostomia impressa	incised odostome	.	.	25	.	.	1.3
Retusa canaliculata (Acteocina)	channeled barrel bubble	.	.	15	.	.	1.3
Nassarius trivittatus (Nassa)	New England dog whelk	.	.	5	.	.	1.0
Lora spp.	lora	.	.	5	.	.	1.0
Mytilidae	mussel	.	.	5	.	.	2.0
Brachiodontes recurvus (Mytilus)	hooked mussel	.	.	20	.	.	0.3
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	.	.	5	.	.	0.8
Modiolus spp. (Volsella)	mussel	.	.	5	.	.	0.0
Gemma gemma	gem clam	.	.	30	.	.	4.4
Mulinia lateralis	duck clam	.	.	25	.	.	9.6
Macoma balthica	Baltic macoma	.	.	35	.	.	4.4
Macoma mitchelli (M. phenax)	Mitchell's clam	.	.	10	.	.	1.3
Mya arenaria	soft-shelled clam	.	.	5	.	.	0.5
Nereis spp.	clam worm	.	.	35	.	.	0.3
Cyathura spp.	isopod	.	.	5	.	.	0.0
Cyathura carinata (polita)	isopod	.	.	5	.	.	0.3
Erichsonella spp.	isopod	.	.	10	.	.	2.3
Chiridotea caeca	isopod	.	.	5	.	.	0.1
Amphipoda	scud, sideswimmer	.	.	15	.	.	5.8
Gammaridae	scud	.	.	10	.	.	4.5
Decapoda	crayfish, shrimp	.	.	15	.	.	0.0
Paneopeus herbstii	mud crab	.	.	25	.	.	13.3
Balanus spp.	barnacle	.	.	30	.	.	15.1
Curculionidae	snout beetle	.	.	5	.	.	0.0
	undetermined fish	.	.	15	.	.	5.5
Goniobasis virginica	snail	17	.	.	15.8	.	.
Hexapaneopeus angustifrons	mud crab	17	.	.	6.7	.	.
Crangon spp.	sand shrimp	17	.	.	5.8	.	.
Arthropoda		17	.	.	3.3	.	.
Isopoda	isopod	17	.	.	3.3	.	.
Hexagenia spp.	mayfly	17	.	.	3.3	.	.
Heliosoma trivolvis	fresh water snail	17	.	.	2.2	.	.
Amnicola spp.	amnicola	17	.	.	2.0	.	.
Pelecypoda (Bivalvia)	bivalve	17	.	5	2.0	.	0.1
Mollusca	mollusk	17	.	.	1.7	.	.
Bittium alternatum (B. nigrum)	alternate bittium	17	.	.	0.3	.	.
Mitrella spp.	mitrella	17	.	.	0.3	.	.
Gastropoda	snail, limpet	17	.	.	0.2	.	.
	Total animal material	83	.	95	47.0	.	75.3

(continued)

APPENDIX TABLE B-3. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (6)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (20)	Aggregate percent[a] Gizzard (6)	Aggregate percent[a] Gullet (.)	Aggregate percent[a] Unknown (20)
Zosteraceae	pondweed	.	.	5	.	.	0.0
Zostera marina	eelgrass	.	.	10	.	.	5.0
Najas guadalupensis	southern naiad	.	.	5	.	.	0.0
Zea mays	corn	.	.	25	.	.	12.6
Distichlis spicata	salt grass	.	.	5	.	.	0.0
Ruppia maritima	widgeongrass	33	.	60	19.2	.	6.1
Potamogeton spp.	pondweed	50	.	.	18.0	.	.
Vallisneria americana (spiralis)	wildcelery	17	.	.	8.3	.	.
	undetermined vegetation	33	.	5	5.5	.	0.0
Potamogeton perfoliatus	redhead grass	17	.	25	1.2	.	0.9
Polygonum arifolium	halberdleaf tear-thumb	17	.	.	0.8	.	.
	Total plant material	83	.	85	53.0	.	24.6

[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-4. FOOD ITEMS OF COMMON GOLDENEYES IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

Scientific name	Common name	Frequency occurrence Gizzard (14)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (12)	Aggregate percent[a] Gizzard (14)	Aggregate percent[a] Gullet (.)	Aggregate percent[a] Unknown (12)
Sayella chesapeakea	snail	.	.	17	.	.	0.0
Goniobasis virginica	snail	.	.	8	.	.	1.0
Heliosoma spp. (Planorbis spp.)	orb snail	.	.	8	.	.	8.3
Gyralus parvus (Planorbis)	fresh water snail	.	.	8	.	.	0.3
Odostomia impressa	incised odostome	.	.	8	.	.	0.0
Nassarius trivittatus (Nassa)	New England dog whelk	.	.	17	.	.	0.3
Gillia altilis	snail	.	.	8	.	.	0.3
Brachiodontes recurvus (Mytilus)	hooked mussel	.	.	33	.	.	2.9
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	.	.	25	.	.	5.0
Mulinia lateralis	duck clam	.	.	8	.	.	4.2
Macoma balthica	Baltic macoma	.	.	17	.	.	1.3
Nereis spp.	clam worm	.	.	25	.	.	0.0
Gammaridae	scud	.	.	17	.	.	4.6
Callinectus sapidus	blue crab	.	.	17	.	.	0.0
Paneopeus herbstii	mud crab	.	.	58	.	.	17.1
Paneopeus spp.	mud crab	.	.	8	.	.	4.2
Sesmarma spp.		.	.	8	.	.	5.4
	undetermined fish	.	.	25	.	.	6.3
Pelecypoda (Bivalvia)	bivalve	29	.	.	7.8	.	.
Mollusca	mollusk	43	.	8	5.5	.	3.1
Trichoptera	caddisfly	7	.	.	5.4	.	.
Lasius spp.	field ant	7	.	.	5.3	.	.
Nassarius obsoletus (Nyanassa)	mud dog whelk	7	.	.	3.8	.	.
Crangon spp.	sand shrimp	7	.	.	2.9	.	.
Cancer borealis	northern crab	7	.	.	2.6	.	.
Anachis avara	greedy dove shell	7	.	.	1.8	.	.
Melanella spp. (Eulima)	snail	7	.	.	1.8	.	.
Mactra spp. (Spisula spp.?)	(winged?) surf clam	7	.	.	1.4	.	.
Apeltes quadracus		7	.	.	1.1	.	.
Cambarus diogenes		7	.	.	1.0	.	.
Neopanope texana sayi	mud crab	14	.	.	0.9	.	.
Arthropoda		21	.	.	0.8	.	.
Veneridae	hard-shelled clam	7	.	.	0.6	.	.
Gastropoda	snail, limpet	14	.	8	0.6	.	0.0
Nereidae	clam worm	29	.	.	0.4	.	.
Cyprinidae	minnow	7	.	.	0.4	.	.
Unionidae	fresh water clam	7	.	.	0.4	.	.
Insecta	insect	7	.	.	0.4	.	.
Anisoptera	dragonfly	7	.	.	0.4	.	.
Bittium spp.		21	.	.	0.3	.	.
Mitrella spp.	mitrella	21	.	.	0.3	.	.
Retusa canaliculata (Acteocina)	channeled barrel bubble	14	.	17	0.1	.	7.7

(continued)

APPENDIX TABLE B-4. (continued)

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (14)	Gullet (.)	Unknown (12)	Gizzard (14)	Gullet (.)	Unknown (12)
Nassarius vibex	mottled dog whelk	7	.	.	0.1	.	.
Bittium alternatum (B. nigrum)	alternate bittium	7	.	.	0.1	.	.
Balanidae	rock barnacle	21	.	.	0.1	.	.
Caralsidae		7	.	.	0.1	.	.
Tachistodes spp.		7	.	.	0.1	.	.
Stenolophus spp.		7	.	.	0.1	.	.
Phytonomus nigrirostris	lesser clover leaf weevil	7	.	.	0.1	.	.
Rhinomacer elongatus	snout beetle	7	.	.	0.1	.	.
Euparius marmoreus		7	.	.	0.1	.	.
Eros spp.		7	.	.	0.1	.	.
Nalsidae		7	.	.	0.1	.	.
Hymenoptera	bee, wasp, ant	7	.	.	0.1	.	.
Ichneumonidae	ichneumonid	7	.	.	0.1	.	.
Crepidula convexa	convex slipper shell	7	.	.	0.0	.	.
Gemma gemma	gem clam	21	.	8	0.0	.	0.0
Annelida	leech, polychaete	7	.	.	0.0	.	.
Isopoda	isopod	7	.	25	0.0	.	10.4
Amphipoda	scud, sideswimmer	7	.	8	0.0	.	0.8
Pissodes nemorensis		7	.	.	0.0	.	.
Chrysomelidae	leaf beetle	7	.	.	0.0	.	.
Systena elongata		7	.	.	0.0	.	.
Bethylidae	bethylid	7	.	.	0.0	.	.
	Total animal material	86	.	100	46.9	.	82.9
Potamogeton perfoliatus	redhead grass	.	.	8	.	.	0.3
Zea mays	corn	43	.	33	24.6	.	8.3
	undetermined vegetation	79	.	8	8.4	.	0.4
Potamogeton spp.	pondweed	21	.	8	7.8	.	3.3
Elodea canadensis	common elodea	7	.	.	7.1	.	.
Vallisneria americana (spiralis)	wildcelery	7	.	.	4.9	.	.
Ruppia maritima	widgeongrass	7	.	25	0.3	.	3.9
Charophyceae	muskgrass, stonewort	7	.	.	0.1	.	.
Zostera marina	eelgrass	7	.	8	0.1	.	0.8
	Total plant material	93	.	67	53.1	.	17.1

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-5. FOOD ITEMS OF CANVASBACKS IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (47)	Gullet (2)	Unknown (52)	Gizzard (47)	Gullet (2)	Unknown (52)
Sayella chesapeakea	snail	.	.	8	.	.	0.2
Bittium varium	variable bittium	.	.	10	.	.	0.8
Triphora nigrocincta (Triforis)	black triphora	.	.	2	.	.	0.1
Mitrella lunata	crescent mitrella	.	.	2	.	.	0.1
Odostomia impressa	incised odostome	.	.	12	.	.	0.3
Nassarius trivittatus (Nassa)	New England dog whelk	.	.	2	.	.	0.2
Hydrobia spp. (Littoridinops)	swamp snail	.	.	6	.	.	0.0
Brachiodontes recurvus (Mytilus)	hooked mussel	.	.	6	.	.	0.6
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	.	.	4	.	.	0.1
Congeria leucophaeta	Conrad's false mussel	.	.	2	.	.	0.7
Laevicardium mortoni	Morton's cockle	.	.	2	.	.	0.1
Gemma gemma	gem clam	.	.	8	.	.	1.0
Mulinia lateralis	duck clam	.	.	19	.	.	5.9
Macoma mitchelli (M. phenax)	Mitchell's clam	.	.	4	.	.	0.1
Mya arenaria	soft-shelled clam	.	.	4	.	.	0.8
Nereis spp.	clam worm	.	.	19	.	.	0.0
Cyathura spp.	isopod	.	.	2	.	.	0.0
Cyathura carinata (polita)	isopod	.	50	2	.	0.0	0.2
Erichsonella spp.	isopod	.	.	8	.	.	1.6
Amphipoda	scud, sideswimmer	.	.	2	.	.	0.0
Gammarus mucronatus	scud	.	.	2	.	.	0.1
Callinectus sapidus	blue crab	.	.	25	.	.	2.1
Ovalipes ocellatus	lady crab	.	.	2	.	.	0.2
Xanthidae (Pilumnidae)	mud crab	.	.	2	.	.	0.8
Paneopeus herbstii	mud crab	.	.	23	.	.	5.6
Pelecypoda (Bivalvia)	bivalve	17	.	6	9.7	.	2.4
Macoma balthica	Baltic macoma	6	.	60	6.4	.	26.5
Polychaeta	polychaete	6	.	2	5.2	.	0.8
Mollusca	mollusk	13	.	6	4.9	.	0.8
Nereidae	clam worm	9	.	.	1.3	.	.
Hexagenia spp.	mayfly	4	.	.	0.4	.	.
Rhithropaneopeus harrisi	white-fingered mud crab	2	.	.	0.2	.	.
Mactra spp. (Spisula spp.?)	(winged?) surf clam	2	.	.	0.2	.	.
Nassariidae (Nassidae)	dog whelk	2	.	.	0.1	.	.
Retusa canaliculata (Acteocina)	channeled barrel bubble	4	.	8	0.1	.	0.6
Nassarius vibex	mottled dog whelk	4	.	.	0.1	.	.
Gastropoda	snail, limpet	6	100	4	0.1	1.0	0.1
Pyramidellidae (Turbinellidae)	pyramid shell	2	.	.	0.0	.	.
Annelida	leech, polychaete	2	.	.	0.0	.	.
Decapoda	crayfish, shrimp	2	.	13	0.0	.	0.2
Neopanope texana sayi	mud crab	2	.	.	0.0	.	.
Rissoidae	risso	2	.	.	0.0	.	.

(continued)

APPENDIX TABLE B-5. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (47)	Gullet (2)	Unknown (52)	Aggregate percent[a] Gizzard (47)	Gullet (2)	Unknown (52)
Bittium spp.		4	.	.	0.0	.	.
Mitrella spp.	mitrella	2	.	.	0.0	.	.
Odostomia spp.	odostome	2	.	.	0.0	.	.
Caralsidae		2	.	.	0.0	.	.
Trichoptera	caddisfly	2	.	.	0.0	.	.
Porifera	sponge	2	.	.	0.0	.	.
	Total animal material	49	100	87	28.7	1.0	52.7
Najas guadalupensis	southern naiad	.	.	2	.	.	0.0
Sparganium eurycarpum	big burreed	.	.	2	.	.	0.2
Cladium mariscoides	twig-rush	.	.	2	.	.	0.0
Scirpus Olneyi	olney threesquare	.	.	4	.	.	0.0
Scirpus robustus	saltmarsh bulrush	.	.	2	.	.	0.0
Chenopodium spp.	goosefoot	.	.	2	.	.	0.0
	woody bark fragments	.	.	2	.	.	1.3
Vallisneria americana (spiralis)	wildcelery	34	100	4	27.1	99.0	3.8
Potamogeton pectinatus	sago pondweed	23	.	4	15.8	.	0.1
	undetermined vegetation	34	.	2	12.7	.	0.6
Zea mays	corn	13	.	25	7.1	.	12.6
Potamogeton perfoliatus	redhead grass	17	.	52	4.2	.	15.8
Scirpus spp.	bulrush	2	50	.	2.1	0.0	.
Sagittaria spp.	arrowhead	2	.	.	1.6	.	.
Potamogeton spp.	pondweed	11	100	.	0.4	0.0	.
Zostera marina	eelgrass	6	.	21	0.1	.	8.2
Ruppia maritima	widgeongrass	4	.	60	0.1	.	4.6
Panicum virgatum	panic grass	2	.	.	0.0	.	.
Agrostemma Githago	corn-cockle	2	.	.	0.0	.	.
Prunus virginiana	choke-cherry	2	.	.	0.0	.	.
Rhus radicans	poison ivy - poison oak	2	.	.	0.0	.	.
Charophyceae	muskgrass, stonewort	2	.	.	0.0	.	.
Cyperaceae	sedge	2	.	2	0.0	.	0.0
Rumex spp.	dock, sorrel	2	.	.	0.0	.	.
	Total plant material	79	100	94	71.3	99.0	47.3

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-6. FOOD ITEMS OF GREATER SCAUP IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (36)	Gullet (2)	Unknown (14)	Gizzard (36)	Gullet (2)	Unknown (14)
Sayella chesapeakea	snail	.	.	29	.	.	0.1
Odostomia impressa	incised odostome	.	50	36	.	35.0	0.0
Nassarius obsoletus (Nyanassa)	mud dog whelk	.	.	21	.	.	5.4
Macoma balthica	Baltic macoma	.	.	29	.	.	2.1
Nereis spp.	clam worm	.	.	7	.	.	0.0
Callinectus sapidus	blue crab	.	.	7	.	.	0.0
Coelenterata (Cnidaria)	hydroid, jellyfish	.	50	.	.	2.5	.
Gastropoda	snail, limpet	25	.	.	8.9	.	.
Mollusca	mollusk	17	.	7	8.2	.	0.7
Goniobasis virginica	snail	14	.	.	6.1	.	.
Gemma gemma	gem clam	14	.	.	3.4	.	.
Pelecypoda (Bivalvia)	bivalve	14	100	.	3.4	20.0	.
Mulinia lateralis	duck clam	6	.	29	2.8	.	21.8
Amnicola spp.	amnicola	3	.	.	2.8	.	.
Anachis avara	greedy dove shell	14	.	.	2.7	.	.
Rhithropaneopeus harrisi	white-fingered mud crab	3	.	.	2.6	.	.
Brachiodontes recurvus (Mytilus)	hooked mussel	8	50	7	2.4	25.0	7.1
Mitrella lunata	crescent mitrella	11	.	14	2.2	.	0.7
Bittium alternatum (B. nigrum)	alternate bittium	11	.	.	2.0	.	.
Laevicardium mortoni	Morton's cockle	3	.	29	1.7	.	4.3
Decapoda	crayfish, shrimp	3	.	.	1.7	.	.
Turbonilla spp.	pyramid shell	3	.	.	1.4	.	.
Nassarius vibex	mottled dog whelk	11	.	7	1.3	.	1.1
Odostomia spp.	odostome	14	.	.	1.0	.	.
Amnicola limosa		3	.	.	0.9	.	.
Bittium spp.		6	.	.	0.7	.	.
Bittium varium	variable bittium	3	.	57	0.7	.	11.2
Cerithopsis spp.	cerith	3	.	.	0.7	.	.
Pyramidella spp.	pyramid shell	3	.	.	0.6	.	.
Nassarius trivittatus (Nassa)	New England dog whelk	3	.	36	0.6	.	5.2
Pleurotomella spp. (Pleurotoma)	pleurotomella	8	.	.	0.3	.	.
Retusa canaliculata (Acteocina)	channeled barrel bubble	11	.	36	0.2	.	6.8
Mitrella spp.	mitrella	6	.	14	0.2	.	0.7
Gammarus fasciatus	scud	3	.	.	0.2	.	.
Neopanope texana sayi	mud crab	6	.	.	0.1	.	.
Triphora nigrocincta (Triforis)	black triphora	6	.	14	0.1	.	0.1
Rissoidae	risso	3	.	.	0.0	.	.
Balanidae	rock barnacle	3	.	.	0.0	.	.
Lycosa spp.	wolf spider	3	.	.	0.0	.	.
Odostomia trifida	tripartite odostome	3	.	.	0.0	.	.
Nereidae	clam worm	3	.	.	0.0	.	.
Xanthidae (Pilumnidae)	mud crab	3	.	.	0.0	.	.

(continued)

APPENDIX TABLE B-6. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (36)	Frequency occurrence Gullet (2)	Frequency occurrence Unknown (14)	Aggregate percent[a] Gizzard (36)	Aggregate percent[a] Gullet (2)	Aggregate percent[a] Unknown (14)
	Total animal material	92	100	100	59.6	82.5	67.3
Vallisneria americana (spiralis)	wildcelery	39	.	.	16.3	.	.
Potamogeton spp.	pondweed	22	50	.	7.6	17.5	.
Zea mays	corn	11	.	21	6.8	.	12.4
Ruppia maritima	widgeongrass	31	.	36	3.2	.	7.8
Zostera marina	eelgrass	6	.	57	2.0	.	12.5
	undetermined vegetation	8	.	.	1.6	.	.
Scirpus spp.	bulrush	3	.	.	0.8	.	.
Potamogeton pectinatus	sago pondweed	3	.	.	0.6	.	.
Sagittaria spp.	arrowhead	3	.	.	0.6	.	.
Paspalum laeve	grass	3	.	.	0.6	.	.
Potamogeton perfoliatus	redhead grass	3	.	.	0.2	.	.
Najas marina	naiad	3	.	.	0.0	.	.
Rhus glabra	smooth sumac	3	.	.	0.0	.	.
Centella erecta (asiactica)	parsley	3	.	.	0.0	.	.
Fimbristylis spp.	saltmarsh fimbristylis	3	.	.	0.0	.	.
Rhus spp.	cashew	3	.	.	0.0	.	.
	Total plant material	86	50	86	40.4	17.5	32.7

[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-7. FOOD ITEMS OF LESSER SCAUP IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

Scientific name	Common name	Frequency occurrence Gizzard (29)	Gullet (.)	Unknown (29)	Aggregate percent[a] Gizzard (29)	Gullet (.)	Unknown (29)
Sayella chesapeakea	snail	.	.	41	.	.	2.0
Bittium varium	variable bittium	.	.	24	.	.	1.5
Triphora nigrocincta (Triforis)	black triphora	.	.	14	.	.	3.1
Odostomia impressa	incised odostome	.	.	31	.	.	1.3
Nassarius trivittatus (Nassa)	New England dog whelk	.	.	10	.	.	0.8
Hydrobia spp. (Littoridinops)	swamp snail	.	.	10	.	.	0.0
Brachiodontes recurvus (Mytilus)	hooked mussel	.	.	38	.	.	3.4
Macoma balthica	Baltic macoma	.	.	24	.	.	5.2
Macoma mitchelli (M. phenax)	Mitchell's clam	.	.	10	.	.	3.1
Mya arenaria	soft-shelled clam	.	.	10	.	.	1.7
Nereis spp.	clam worm	.	.	7	.	.	0.0
Chiridotea caeca	isopod	.	.	14	.	.	1.6
Amphipoda	scud, sideswimmer	.	.	10	.	.	0.3
Gammarus mucronatus	scud	.	.	17	.	.	3.6
Ovalipes ocellatus	lady crab	.	.	7	.	.	0.3
Podocopa	ostracod	.	.	7	.	.	0.0
Curculionidae	snout beetle	.	.	3	.	.	0.1
Coelenterata (Cnidaria)	hydroid, jellyfish	.	.	7	.	.	0.0
Gastropoda	snail, limpet	55	.	3	8.7	.	0.0
Amnicola spp.	amnicola	10	.	.	6.9	.	.
Goniobasis virginica	snail	31	.	.	6.4	.	.
Gillia altilis	snail	10	.	.	4.3	.	.
Amnicola limosa		7	.	.	3.4	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	3	.	3	3.4	.	0.3
Mollusca	mollusk	14	.	.	3.1	.	.
Pelecypoda (Bivalvia)	bivalve	28	.	3	2.7	.	0.1
Bittium alternatum (B. nigrum)	alternate bittium	3	.	.	2.1	.	.
Unionidae	fresh water clam	7	.	.	1.6	.	.
Anculosa spp.	river snail	3	.	.	0.6	.	.
Gyralus parvus (Planorbis)	fresh water snail	3	.	.	0.6	.	.
Valvata tricarinata		3	.	.	0.6	.	.
Bittium spp.		7	.	3	0.6	.	0.2
Heliosoma spp. (Planorbis spp.)	orb snail	10	.	.	0.6	.	.
Nassarius obsoletus (Nyanassa)	mud dog whelk	3	.	.	0.5	.	.
Mitrella lunata	crescent mitrella	10	.	.	0.3	.	.
Odostomia spp.	odostome	10	.	.	0.3	.	.
Gemma gemma	gem clam	7	.	28	0.3	.	2.6
Elliptio complanata (Unio)		3	.	.	0.3	.	.
Mulinia lateralis	duck clam	7	.	45	0.2	.	16.1
Sphaerium spp.	sphere shell	3	.	.	0.2	.	.
Daphnidae	water flea	3	.	.	0.2	.	.
Trichoptera	caddisfly	10	.	.	0.1	.	.

(continued)

APPENDIX TABLE B-7. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (29)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (29)	Aggregate percent[a] Gizzard (29)	Aggregate percent[a] Gullet (.)	Aggregate percent[a] Unknown (29)
Crepidula spp.	slipper shell	7	.	.	0.1	.	.
Neopanope texana sayi	mud crab	7	.	.	0.1	.	.
Rissoidae	risso	7	.	10	0.1	.	3.6
Gyralus spp. (Planorbis spp.)		3	.	.	0.1	.	.
Retusa canaliculata (Acteocina)	channeled barrel bubble	10	.	52	0.1	.	12.0
Crangonyx spp.	amphipod	3	.	.	0.1	.	.
Decapoda	crayfish, shrimp	7	.	7	0.1	.	0.0
Crepidula convexa	convex slipper shell	3	.	.	0.0	.	.
Modiolus spp. (Volsella)	mussel	3	.	.	0.0	.	.
Mactra spp. (Spisula spp.?)	(winged?) surf clam	3	.	.	0.0	.	.
Nereidae	clam worm	10	.	.	0.0	.	.
Balanidae	rock barnacle	7	.	.	0.0	.	.
Pyramidellidae (Turbinellidae)	pyramid shell	3	.	.	0.0	.	.
Mytilidae	mussel	3	.	.	0.0	.	.
Laevicardium mortoni	Morton's cockle	3	.	21	0.0	.	5.2
Xanthidae (Pilumnidae)	mud crab	3	.	.	0.0	.	.
Cumacea		3	.	.	0.0	.	.
Insecta	insect	3	.	.	0.0	.	.
Formicidae	ant	3	.	.	0.0	.	.
	Total animal material	90	.	97	48.6	.	68.0
Pinus Taeda	loblolly pine	.	.	3	.	.	0.1
Potamogeton pectinatus	sago pondweed	.	.	3	.	.	0.2
Cladium mariscoides	twig-rush	.	.	3	.	.	0.0
Scirpus Olneyi	olney threesquare	.	.	28	.	.	0.8
Scirpus robustus	saltmarsh bulrush	.	.	7	.	.	0.0
Distichlis spicata	salt grass	.	.	3	.	.	0.0
Myrica spp.	wax-myrtle	.	.	3	.	.	0.0
Polygonum pensylvanicum	smartweed	.	.	3	.	.	0.0
Polygonum punctatum	dotted smartweed	.	.	3	.	.	0.0
Nyssa sylvatica (biflora)	black gum (sour gum)	.	.	7	.	.	0.3
Iva frutescens	marsh-elder	.	.	7	.	.	0.0
Zea mays	corn	31	.	38	19.5	.	16.8
	undetermined vegetation	52	.	7	6.7	.	0.5
Vallisneria americana (spiralis)	wildcelery	7	.	.	6.1	.	.
Vitis spp.	grape, wild grape	3	.	.	3.4	.	.
Ruppia maritima	widgeongrass	24	.	48	3.4	.	4.2
Potamogeton perfoliatus	redhead grass	14	.	21	3.4	.	5.5
Potamogeton spp.	pondweed	14	.	.	2.9	.	.
Sagittaria spp.	arrowhead	3	.	.	2.3	.	.
Potamogeton pusillus	slender pondweed	7	.	.	1.4	.	.
Zostera marina	eelgrass	10	.	7	1.1	.	3.6
Najas flexilis	northern naiad	7	.	.	0.8	.	.
Scirpus spp.	bulrush	14	.	.	0.4	.	.
	Total plant material	83	.	93	51.4	.	32.0

[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-8. FOOD ITEMS OF RING-NECKED DUCKS IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (17)	Gullet (.)	Unknown (7)	Gizzard (17)	Gullet (.)	Unknown (7)
Brachiodontes recurvus (Mytilus)	hooked mussel	.	.	14	.	.	0.7
Gemma gemma	gem clam	.	.	14	.	.	0.3
Mulinia lateralis	duck clam	.	.	14	.	.	10.7
Macoma balthica	Baltic macoma	.	.	14	.	.	0.4
Goniobasis virginica	snail	35	.	.	32.4	.	.
Mollusca	mollusk	24	.	.	1.0	.	.
Insecta	insect	12	.	.	0.6	.	.
Trichoptera	caddisfly	12	.	.	0.4	.	.
Pelecypoda (Bivalvia)	bivalve	6	.	14	0.2	.	1.4
Valvata tricarinata		6	.	.	0.1	.	.
Gastropoda	snail, limpet	6	.	.	0.1	.	.
Daphnia spp.	water flea	6	.	.	0.0	.	.
	Total animal material	82	.	29	34.6	.	13.6
Ruppia maritima	widgeongrass	.	.	29	.	.	13.6
Potamogeton perfoliatus	redhead grass	.	.	29	.	.	1.4
Potamogeton epihydrus	ribbonleaf pondweed	.	.	14	.	.	0.0
Sparganium americanum	eastern burreed	.	.	43	.	.	1.7
Sparganium eurycarpum	big burreed	.	.	14	.	.	0.3
Scirpus americanus	common threesquare	.	.	14	.	.	0.0
Scirpus fluviatilis	river bulrush	.	.	29	.	.	0.4
Scirpus Olneyi	olney threesquare	.	.	14	.	.	0.6
Scirpus validus	softstem bulrush	.	.	29	.	.	0.1
Carex spp.	sedge	.	.	14	.	.	0.0
Carex lurida	sedge	.	.	14	.	.	0.0
Carex crinita	sedge	.	.	14	.	.	0.0
Echinochloa crusgalli	barnyard grass	.	.	14	.	.	0.0
Echinochloa Walteri		.	.	14	.	.	0.0
Paspalum laeve	grass	.	.	14	.	.	0.0
Spartina alterniflora (stricta)	saltmarsh cordgrass	.	.	14	.	.	0.0
Peltandra virginica	arrow arum	.	.	29	.	.	17.6
Pontederia cordata	pickerel weed (tuckahoe)	.	.	29	.	.	0.4
Smilax spp.	lily	.	.	14	.	.	0.0
Carpinus caroliniana	hornbeam (blue beech)	.	.	14	.	.	0.0
Acnida cannabinus (amaranthus)	tidemarsh waterhemp	.	.	14	.	.	0.0
Polygonum spp.	smartweed	.	.	14	.	.	0.0
Polygonum arifolium	halberdleaf tear-thumb	.	.	14	.	.	4.3
Polygonum punctatum	dotted smartweed	.	.	43	.	.	17.1
Geranium spp.	wild geranium	.	.	14	.	.	0.0
Rubus spp.	bramble	.	.	14	.	.	0.0
Lespedeza stipulacea	Korean lespedeza	.	.	14	.	.	0.0
Rhus spp.	cashew	.	.	29	.	.	0.0
Ilex spp.	holly	.	.	14	.	.	0.7

(continued)

APPENDIX TABLE B-8. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (17)	 Gullet (.)	 Unknown (7)	Aggregate percent[a] Gizzard (17)	 Gullet (.)	 Unknown (7)
Cornus spp.	dogwood	.	.	14	.	.	0.0
Cuscuta spp.	dodder	.	.	29	.	.	0.3
Nuphar advena	yellow water lily	.	.	14	.	.	2.1
Potamogeton spp.	pondweed	53	.	.	40.7	.	.
Najas flexilis	northern naiad	29	.	.	8.8	.	.
	undetermined vegetation	47	.	.	7.2	.	.
Potamogeton pusillus	slender pondweed	24	.	.	3.1	.	.
Potamogeton pectinatus	sago pondweed	12	.	.	2.8	.	.
Vallisneria americana (spiralis)	wildcelery	6	.	.	2.1	.	.
Characeae	muskgrass	6	.	.	0.5	.	.
Najas spp.	naiad	6	.	.	0.1	.	.
Cladium mariscoides	twig-rush	6	.	29	0.1	.	0.0
Scirpus pallidus	black bulrush	12	.	.	0.1	.	.
Zea mays	corn	6	.	29	0.0	.	25.7
	Total plant material	88	.	100	65.4	.	86.4

[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-9. FOOD ITEMS OF REDHEADS IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

Scientific name	Common name	Frequency occurrence Gizzard (10)	 Gullet (3)	 Unknown (86)	Aggregate percent[a] Gizzard (10)	 Gullet (3)	 Unknown (86)
Physa heterostropha	snail	.	67	.	.	0.7	.
Bittium spp.		.	.	1	.	.	0.0
Bittium varium	variable bittium	.	.	1	.	.	0.0
Bittium alternatum (B. nigrum)	alternate bittium	.	.	1	.	.	0.0
Heliosoma spp. (Planorbis spp.)	orb snail	.	33	.	.	1.7	.
Heliosoma antrosa (Planorbis)		.	33	.	.	0.3	.
Gyralus spp. (Planorbis spp.)		.	33	.	.	3.7	.
Triphora nigrocincta (Triforis)	black triphora	.	.	1	.	.	0.0
Odostomia spp.	odostome	.	.	1	.	.	0.0
Odostomia impressa	incised odostome	.	.	2	.	.	0.0
Retusa canaliculata (Acteocina)	channeled barrel bubble	.	.	1	.	.	0.0
Nassarius obsoletus (Nyanassa)	mud dog whelk	.	.	1	.	.	0.0
Hydrobia spp. (Littoridinops)	swamp snail	.	.	1	.	.	0.0
Amnicola limosa		.	67	.	.	0.0	.
Valvata tricarinata		.	33	.	.	0.3	.
Pelecypoda (Bivalvia)	bivalve	.	.	2	.	.	0.0
Mytilidae	mussel	.	.	5	.	.	0.0
Congeria leucophaeta	Conrad's false mussel	.	.	1	.	.	0.0
Gemma gemma	gem clam	.	.	3	.	.	0.1
Macoma balthica	Baltic macoma	.	.	2	.	.	0.1
Mya arenaria	soft-shelled clam	.	.	2	.	.	0.1
Pisidium alsditum	fresh-water clam	.	67	.	.	0.3	.
Nereis spp.	clam worm	.	.	3	.	.	0.0
Isopoda	isopod	.	.	2	.	.	0.0
Erichsonella spp.	isopod	.	.	7	.	.	0.2
Amphipoda	scud, sideswimmer	.	.	7	.	.	0.1
Decapoda	crayfish, shrimp	.	.	2	.	.	0.0
Xanthidae (Pilumnidae)	mud crab	.	.	1	.	.	0.0
Paneopeus herbstii	mud crab	.	.	5	.	.	0.3
Balanidae	rock barnacle	.	.	1	.	.	0.0
Cypris spp.	seed shrimp	.	33	.	.	0.0	.
Haliplidae	crawling water beetle	.	67	.	.	0.0	.
Trichoptera	caddisfly	.	67	.	.	0.0	.
Corixidae	water boatman	.	.	1	.	.	0.0
Hydrachna spp.	freshwater mite	.	67	.	.	0.0	.
Gastropoda	snail, limpet	20	.	6	0.3	.	0.0
Mollusca	mollusk	10	.	.	0.1	.	.
	Total animal material	30	67	24	0.4	7.0	1.0
Rhodophyceae	red algae	.	.	5	.	.	0.0
Ulva spp.	sea lettuce	.	.	1	.	.	0.4
Ulva lactuca	sea lettuce	.	.	6	.	.	2.3
Characeae	muskgrass	.	67	.	.	0.0	.

(continued)

APPENDIX TABLE B-9. (continued)

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (10)	Gullet (3)	Unknown (86)	Gizzard (10)	Gullet (3)	Unknown (86)
Chara spp.	muskgrass	.	.	1	.	.	0.0
Zosteraceae	pondweed	.	.	1	.	.	1.0
Zostera marina	eelgrass	.	.	35	.	.	18.2
Zannichellia palustris	horned pondweed	.	67	.	.	1.7	.
Najas guadalupensis	southern naiad	.	33	.	.	3.3	.
Najas marina	naiad	.	33	.	.	26.7	.
Elodea canadensis	common elodea	.	33	14	.	16.7	10.1
Cyperaceae	sedge	.	.	1	.	.	0.0
Scirpus Olneyi	olney threesquare	.	.	6	.	.	0.1
Scirpus robustus	saltmarsh bulrush	.	.	1	.	.	0.0
Fimbristylis spp.	saltmarsh fimbristylis	.	.	1	.	.	0.0
Setaria spp.	foxtail grass	.	.	1	.	.	0.0
Sorgum spp.	grass	.	.	2	.	.	0.6
Zea mays	corn	.	33	27	.	33.3	16.9
Acnida cannabinus (amaranthus)	tidemarsh waterhemp	.	33	.	.	0.0	.
Polygonum spp.	smartweed	.	33	.	.	0.0	.
Rubus spp.	bramble	.	33	.	.	0.0	.
Vitis spp.	grape, wild grape	.	.	1	.	.	0.0
Cicuta spp.	water-hemlock	.	67	.	.	0.3	.
Potamogeton spp.	pondweed	40	67	1	33.5	0.7	0.0
	undetermined vegetation	50	.	1	16.6	.	0.0
Potamogeton pectinatus	sago pondweed	20	.	6	14.0	.	0.0
Vallisneria americana (spiralis)	wildcelery	10	67	.	10.0	0.3	.
Scirpus spp.	bulrush	10	.	1	10.0	.	0.0
Zizania aquatica	wildrice	10	.	.	7.5	.	.
Potamogeton perfoliatus	redhead grass	10	.	81	4.5	.	42.9
Ruppia maritima	widgeongrass	20	.	45	2.0	.	6.3
Najas flexilis	northern naiad	10	33	.	1.5	10.0	.
	Total plant material	100	100	100	99.6	93.0	99.0

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-10. FOOD ITEMS OF AMERICAN WIGEON IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

		Frequency occurrence			Aggregate percent[a]		
Scientific name	Common name	Gizzard (35)	Gullet (4)	Unknown (109)	Gizzard (35)	Gullet (4)	Unknown (109)
Bittium varium	variable bittium	.	.	1	.	.	0.1
Planorbidae	orb snail	.	.	1	.	.	0.0
Gemma gemma	gem clam	.	.	1	.	.	0.0
Macoma balthica	Baltic macoma	.	.	1	.	.	0.1
Nereis spp.	clam worm	.	25	.	.	0.0	.
Amphipoda	scud, sideswimmer	.	.	1	.	.	0.0
Coelenterata (Cnidaria)	hydroid, jellyfish	.	.	2	.	.	0.1
Gammarus spp.	scud	3	.	.	1.4	.	.
Chironomidae	midge	3	.	.	1.4	.	.
Corixidae	water boatman	6	.	.	0.1	.	.
Hydrophilidae	water scavenger beetle	3	.	.	0.0	.	.
Araneae	spider	3	.	.	0.0	.	.
	Total animal material	9	25	6	2.9	0.0	0.3
Ulva lactuca	sea lettuce	.	.	2	.	.	1.0
Enteromorpha spp.	filamentous green algae	.	.	1	.	.	0.1
Potamogeton perfoliatus	redhead grass	.	50	39	.	43.8	23.1
Zannichellia palustris	horned pondweed	.	.	1	.	.	0.0
Najas guadalupensis	southern naiad	.	.	1	.	.	0.0
Elodea canadensis	common elodea	.	.	7	.	.	5.7
Cladium mariscoides	twig-rush	.	.	1	.	.	0.1
Digitaria spp.	crab grass	.	.	1	.	.	0.1
Panicum spp.	panic grass	.	.	1	.	.	0.1
Setaria spp.	foxtail grass	.	.	1	.	.	0.0
Setaria italica	millet	.	.	1	.	.	0.0
Zea mays	corn	.	.	2	.	.	1.1
Spartina spp.	cordgrass	.	.	1	.	.	0.0
Spartina alterniflora (stricta)	saltmarsh cordgrass	.	.	3	.	.	1.8
Pontederia cordata	pickerel weed (tuckahoe)	.	.	1	.	.	0.0
Amaranthus spp.	amaranth	.	.	1	.	.	0.0
Polygonum punctatum	dotted smartweed	.	.	1	.	.	0.0
Ruppia maritima	widgeongrass	80	75	68	66.0	16.5	39.3
Characeae	muskgrass	11	.	.	6.3	.	.
Potamogeton pectinatus	sago pondweed	9	.	1	6.1	.	0.0
Chara spp.	muskgrass	9	.	17	3.1	.	9.3
Zostera marina	eelgrass	3	50	28	2.9	39.8	13.0
Vallisneria americana (spiralis)	wildcelery	3	.	.	2.9	.	.
Chlorophyceae	green algae	3	.	1	2.8	.	0.0
Zizania aquatica	wildrice	3	.	.	2.1	.	.
Distichlis spicata	salt grass	9	.	8	1.9	.	2.6
Nitella spp.	nitella	3	.	.	1.9	.	.
Eleocharis palustris	common spikerush	3	.	.	1.0	.	.
	undetermined vegetation	6	.	1	0.1	.	0.6

(continued)

APPENDIX TABLE B-10. (continued)

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (35)	Gullet (4)	Unknown (109)	Gizzard (35)	Gullet (4)	Unknown (109)
Scirpus Olneyi	olney threesquare	14	.	13	0.1	.	1.0
Scirpus validus	softstem bulrush	3	.	.	0.0	.	.
Gramineae	grasses	6	.	1	0.0	.	0.6
Cyperus odorattes	galingale	3	.	.	0.0	.	.
Eleocharis parvula	dwarf spikerush	3	.	.	0.0	.	.
Scirpus americanus	common threesquare	3	.	.	0.0	.	.
Scirpus robustus	saltmarsh bulrush	3	.	.	0.0	.	.
Iva frutescens	marsh-elder	3	.	.	0.0	.	.
	Total plant material	97	100	100	97.1	100.0	99.7

[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-11. FOOD ITEMS OF BLUE-WINGED TEAL IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

		Frequency occurrence			Aggregate percent[a]		
Scientific name	Common name	Gizzard (21)	Gullet (.)	Unknown (34)	Gizzard (21)	Gullet (.)	Unknown (34)
	undetermind animal	.	.	6	.	.	0.4
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	.	.	3	.	.	0.7
Gammaridae	scud	.	.	3	.	.	0.0
Coleoptera	beetle	.	.	3	.	.	0.0
Galerucella spp.	leaf beetle	.	.	3	.	.	0.0
Libelluidae	common skimmer	.	.	3	.	.	1.2
Araneae	spider	.	.	3	.	.	0.0
Hydrobia spp. (Littoridinops)	swamp snail	24	.	38	4.1	.	8.3
Podocopa	ostracod	24	.	12	2.3	.	0.4
Sphenophorus spp.	billbug	29	.	15	1.0	.	0.3
Tropisternus spp.		5	.	.	1.0	.	.
Melampus bidentatus	salt marsh snail	10	.	12	0.2	.	0.3
Berosus spp.		14	.	.	0.2	.	.
Chironomidae	midge	5	.	.	0.2	.	.
Formicidae	ant	5	.	6	0.1	.	1.8
Isopoda	isopod	5	.	.	0.0	.	.
Amphipoda	scud, sideswimmer	5	.	.	0.0	.	.
Scarabaeidae	scarab beetle	5	.	.	0.0	.	.
Curculionidae	snout beetle	5	.	.	0.0	.	.
Enochrus spp.		5	.	.	0.0	.	.
Gastropoda	snail, limpet	5	.	.	0.0	.	.
Insecta	insect	5	.	6	0.0	.	0.0
Dytiscidae	predaceous diving beetle	5	.	.	0.0	.	.
Hydrophilidae	water scavenger beetle	5	.	.	0.0	.	.
Corixidae	water boatman	5	.	6	0.0	.	0.0
	Total animal material	67	.	59	9.3	.	13.4
Zosteraceae	pondweed	.	.	3	.	.	1.8
Potamogeton spp.	pondweed	.	.	3	.	.	0.0
Potamogeton pusillus	slender pondweed	.	.	6	.	.	0.0
Sparganium americanum	eastern burreed	.	.	12	.	.	0.1
Sparganium eurycarpum	big burreed	.	.	3	.	.	0.0
Eleocharis parvula	dwarf spikerush	.	.	9	.	.	0.0
Eleocharis olivacea	spikerush	.	.	3	.	.	0.0
Scirpus americanus	common threesquare	.	.	6	.	.	0.1
Scirpus validus	softstem bulrush	.	.	21	.	.	0.9
Carex crinita	sedge	.	.	3	.	.	0.0
Echinochloa Walteri		.	.	24	.	.	2.1
Zea mays	corn	.	.	3	.	.	2.4
Zizania aquatica	wildrice	.	.	3	.	.	0.0
Pontederia cordata	pickerel weed (tuckahoe)	.	.	6	.	.	0.3
Chenopodium spp.	goosefoot	.	.	3	.	.	0.0
Amaranthus spp.	amaranth	.	.	3	.	.	0.0

(continued)

APPENDIX TABLE B-11. (continued)

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (21)	Gullet (.)	Unknown (34)	Gizzard (21)	Gullet (.)	Unknown (34)
Acnida cannabinus (amaranthus)	tidemarsh waterhemp	.	.	12	.	.	0.6
Polygonum arifolium	halberdleaf tear-thumb	.	.	9	.	.	0.8
Polygonum hydropiperoides	swamp smartweed	.	.	3	.	.	0.0
Polygonum punctatum	dotted smartweed	.	.	29	.	.	19.1
Ambrosia artemisiifolia	ragweed	.	.	3	.	.	0.0
Baccharis halimifolia	groundsel tree	.	.	3	.	.	0.0
Scirpus Olneyi	olney threesquare	81	.	71	48.5	.	21.1
Ruppia maritima	widgeongrass	67	.	59	12.9	.	19.0
Potamogeton pectinatus	sago pondweed	5	.	.	4.8	.	.
Polygonum sagittatum	smartweed	5	.	.	4.8	.	.
Scirpus robustus	saltmarsh bulrush	33	.	32	4.7	.	1.6
Cladium mariscoides	twig-rush	48	.	26	3.1	.	0.6
Iva frutescens	marsh-elder	10	.	24	2.9	.	5.9
Gramineae	grasses	5	.	3	2.4	.	0.0
Polygonum spp.	smartweed	5	.	.	1.9	.	.
	undetermined vegetation	10	.	6	1.9	.	1.8
Spartina cynosuroides	big cordgrass	10	.	6	1.2	.	0.1
Distichlis spicata	salt grass	24	.	29	0.9	.	2.5
Sparganium androcladum	shining burreed	5	.	.	0.5	.	.
Chara spp.	muskgrass	10	.	12	0.1	.	5.1
Eleocharis palustris	common spikerush	5	.	6	0.1	.	0.0
Myrica spp.	wax-myrtle	5	.	6	0.1	.	0.0
Potamogeton perfoliatus	redhead grass	5	.	3	0.0	.	0.7
Cyperus odorattes	galingale	5	.	.	0.0	.	.
Carex spp.	sedge	5	.	.	0.0	.	.
Spartina spp.	cordgrass	5	.	.	0.0	.	.
Cuscuta spp.	dodder	5	.	18	0.0	.	0.1
	Total plant material	95	.	100	90.7	.	86.6

[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-12. FOOD ITEMS OF GREEN-WINGED TEAL IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (10)	Gullet (.)	Unknown (34)	Gizzard (10)	Gullet (.)	Unknown (34)
Amnicola spp.	amnicola	.	.	3	.	.	0.3
Melampus bidentatus	salt marsh snail	.	.	15	.	.	1.1
Pelecypoda (Bivalvia)	bivalve	.	.	3	.	.	0.1
Nereis spp.	clam worm	.	.	9	.	.	0.0
Isopoda	isopod	.	.	6	.	.	0.0
Chiridotea caeca	isopod	.	.	6	.	.	4.9
Leptochelia savigny		.	.	9	.	.	2.2
Amphipoda	scud, sideswimmer	.	.	9	.	.	0.4
Gammaridae	scud	.	.	12	.	.	0.8
Corophium spp.	amphipod	.	.	3	.	.	0.8
Decapoda	crayfish, shrimp	.	.	3	.	.	0.0
Insecta	insect	.	.	3	.	.	0.3
Caralsidae		.	.	3	.	.	0.0
Stenolophus spp.		.	.	3	.	.	0.0
Triliarthrus badiipennis		.	.	3	.	.	0.0
Amara spp.		.	.	3	.	.	0.0
Phytonomus nigrirostris	lesser clover leaf weevil	.	.	3	.	.	0.0
Phytonomus meles		.	.	3	.	.	0.0
Graphops pulsescens		.	.	3	.	.	0.0
Hydrophilidae	water scavenger beetle	.	.	3	.	.	0.0
Berosus spp.		.	.	3	.	.	0.0
Tropisternus spp.		.	.	3	.	.	0.0
Atheta spp.		.	.	3	.	.	0.0
Corixidae	water boatman	.	.	3	.	.	0.0
Nysius spp.		.	.	3	.	.	0.0
Ichneumonidae	ichneumonid	.	.	3	.	.	0.0
Fulgoridae	fulgorid planthopper	.	.	3	.	.	0.0
Diptera	fly	.	.	9	.	.	0.4
Chironomidae	midge	.	.	9	.	.	1.9
Tanaidae	aquatic sowbug	20	.	.	9.5	.	.
Hydrobia spp. (Littoridinops)	swamp snail	30	.	15	4.4	.	1.0
Bittium varium	variable bittium	10	.	.	1.0	.	.
Gastropoda	snail, limpet	10	.	.	0.2	.	.
Nereidae	clam worm	10	.	3	0.0	.	0.0
Podocopa	ostracod	10	.	26	0.0	.	1.1
Popillia japonica	Japanese beetle	10	.	.	0.0	.	.
Dytiscidae	predaceous diving beetle	10	.	.	0.0	.	.
Sphenophorus spp.	billbug	10	.	3	0.0	.	0.0
	Total animal material	60	.	65	15.1	.	15.4
Chara spp.	muskgrass	.	.	12	.	.	5.7
Potamogeton pectinatus	sago pondweed	.	.	9	.	.	0.1
Potamogeton pusillus	slender pondweed	.	.	6	.	.	0.0

(continued)

APPENDIX TABLE B-12. (continued)

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (10)	Gullet (.)	Unknown (34)	Gizzard (10)	Gullet (.)	Unknown (34)
Potamogeton epihydrus	ribbonleaf pondweed	.	.	6	.	.	0.8
Zannichellia palustris	horned pondweed	.	.	6	.	.	0.0
Najas spp.	naiad	.	.	3	.	.	0.0
Najas guadalupensis	southern naiad	.	.	6	.	.	0.0
Najas flexilis	northern naiad	.	.	6	.	.	0.1
Vallisneria americana (spiralis)	wildcelery	.	.	3	.	.	0.0
Sparganium americanum	eastern burreed	.	.	6	.	.	0.0
Sagittaria latifolia	broadleaf arrowhead	.	.	3	.	.	0.3
Cyperus filicinus	galingale	.	.	3	.	.	0.0
Eleocharis palustris	common spikerush	.	.	3	.	.	0.0
Scirpus spp.	bulrush	.	.	6	.	.	0.0
Scirpus fluviatilis	river bulrush	.	.	9	.	.	1.5
Scirpus robustus	saltmarsh bulrush	.	.	26	.	.	4.6
Carex lurida	sedge	.	.	3	.	.	0.0
Fuirena spp.	fuirena	.	.	3	.	.	0.0
Rhynchospora capitellata	beak-rush	.	.	3	.	.	0.0
Echinochloa spp.		.	.	3	.	.	0.0
Zea mays	corn	.	.	6	.	.	2.1
Spartina spp.	cordgrass	.	.	6	.	.	0.1
Pontederia cordata	pickerel weed (tuckahoe)	.	.	6	.	.	0.1
Atriplex patula	spearscale	.	.	3	.	.	0.0
Acnida cannabinus (amaranthus)	tidemarsh waterhemp	.	.	3	.	.	0.7
Polygonum sagittatum	smartweed	.	.	6	.	.	1.3
Myriophyllum spp.	watermilfoil	.	.	3	.	.	0.0
Proserpinaca palustris	marsh mermaidweed	.	.	3	.	.	0.1
Hedeoma pulegoides	American pennyroyal	.	.	3	.	.	0.0
Ambrosia artemisiifolia	ragweed	.	.	3	.	.	0.0
Bidens spp.	beggar-tick	.	.	3	.	.	0.0
Iva frutescens	marsh-elder	.	.	9	.	.	0.3
Portulaca spp.	purslane	.	.	3	.	.	0.0
Mollugo verticilliata	carpet-weed	.	.	3	.	.	0.0
Juncus Roemerianus	needlerush	.	.	3	.	.	2.6
	undetermined vegetation	.	.	3	.	.	1.0
Scirpus Olneyi	olney threesquare	70	.	71	35.5	.	23.9
Ruppia maritima	widgeongrass	60	.	68	8.6	.	11.0
Polygonum punctatum	dotted smartweed	20	.	29	6.6	.	13.0
Spartina alterniflora (stricta)	saltmarsh cordgrass	10	.	3	6.3	.	1.0
Carex spp.	sedge	10	.	6	6.0	.	0.0
Distichlis spicata	salt grass	20	.	24	5.3	.	2.0
Fimbristylis castanea	saltmarsh fimbristylis	10	.	.	4.0	.	.
Cladium mariscoides	twig-rush	50	.	35	3.3	.	1.6
Cyperus odorattes	galingale	10	.	.	3.0	.	.
Leersia oryzoides	cut grass	10	.	3	2.0	.	0.1

(continued)

APPENDIX TABLE B-12. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (10)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (34)	Aggregate percent[a] Gizzard (10)	Aggregate percent[a] Gullet (.)	Aggregate percent[a] Unknown (34)
Polygonum pensylvanicum	smartweed	20	.	.	2.0	.	.
Cephalanthus occidentalis	buttonbush	10	.	3	2.0	.	0.0
Polygonum arifolium	halberdleaf tear-thumb	10	.	12	0.2	.	1.7
Cuscuta spp.	dodder	20	.	18	0.1	.	0.2
Pinus Taeda	loblolly pine	10	.	.	0.0	.	.
Potamogeton spp.	pondweed	10	.	9	0.0	.	0.0
Eleocharis spp.	spikerush	20	.	3	0.0	.	0.0
Eleocharis parvula	dwarf spikerush	30	.	15	0.0	.	4.1
Scirpus americanus	common threesquare	10	.	15	0.0	.	0.5
Scirpus validus	softstem bulrush	20	.	29	0.0	.	3.0
Echinochloa Walteri		10	.	3	0.0	.	0.9
Panicum spp.	panic grass	10	.	6	0.0	.	0.0
Myrica cerifera	wax-myrtle	10	.	3	0.0	.	0.0
Ranunculus sceleratus	cursed crowfoot	10	.	.	0.0	.	.
Lippia lanceolata	fog-fruit	10	.	.	0.0	.	.
Teucrium canadense	germander (wood sage)	10	.	.	0.0	.	.
Galium spp.	bedstraw, cleavers	10	.	.	0.0	.	.
Nymphaea odorata (Castalia)	white water lily	10	.	.	0.0	.	.
	Total plant material	100	.	100	84.9	.	84.6

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-13. FOOD ITEMS OF BLACK DUCKS IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (55)	Gullet (2)	Unknown (128)	Gizzard (55)	Gullet (2)	Unknown (128)
Gastropoda	snail, limpet	.	.	1	.	.	0.0
Rissoidae	risso	.	.	1	.	.	0.2
Sayella chesapeakea	snail	.	.	1	.	.	0.0
Goniobasis virginica	snail	.	.	1	.	.	0.5
Bittium varium	variable bittium	.	.	2	.	.	0.0
Littorina irrorata	marsh periwinkle	.	.	1	.	.	0.2
Mytilidae	mussel	.	.	1	.	.	0.3
Corbiculiidae (Cyrenidae)	marsh clam	.	.	1	.	.	0.0
Macoma mitchelli (M. phenax)	Mitchell's clam	.	.	1	.	.	0.0
Pisidium atlanticum	fresh-water clam	.	.	1	.	.	0.0
Cyrenoida floridana (Cyrenella)		.	.	2	.	.	0.0
Arthropoda		.	.	2	.	.	0.0
Cyathura carinata (polita)	isopod	.	.	1	.	.	0.0
Erichsonella spp.	isopod	.	.	2	.	.	0.1
Chiridotea caeca	isopod	.	50	1	.	0.0	0.1
Gammaridae	scud	.	.	2	.	.	0.1
Ovalipes ocellatus	lady crab	.	.	1	.	.	0.2
Balanus spp.	barnacle	.	.	1	.	.	0.0
Insecta	insect	.	.	5	.	.	0.1
Coleoptera	beetle	.	.	3	.	.	0.0
Caralsidae		.	.	2	.	.	0.0
Aphodius spp.	dung beetle	.	.	1	.	.	0.0
Bidessus spp.		.	.	1	.	.	0.0
Galerucella spp.	leaf beetle	.	.	1	.	.	0.0
Hydrophilus spp.	water scavenger beetle	.	.	1	.	.	0.1
Staphylinidae	rove beetle	.	.	1	.	.	0.0
Gelastocoridae	toad bug	.	.	1	.	.	0.2
Hymenoptera	bee, wasp, ant	.	.	1	.	.	0.0
Gryllotalpa	northern mole cricket	.	.	2	.	.	0.4
Cicadellidae	leafhopper	.	.	1	.	.	0.0
Tipulidae	crane fly	.	.	1	.	.	0.0
Culicidae	mosquito	.	.	2	.	.	0.7
Aedes sollicitans	salt marsh mosquito	.	.	2	.	.	1.2
Aedes spp.	mosquito	.	.	1	.	.	0.2
Hydracarina (Acarina)	mite	.	.	1	.	.	0.0
Coelenterata (Cnidaria)	hydroid, jellyfish	.	.	1	.	.	0.0
Molgula spp.	sea grape	.	.	1	.	.	0.3
Cyprinodon variegatus	sheepshead minnow	7	.	2	4.9	.	0.9
Melampus bidentatus	salt marsh snail	9	.	25	3.8	.	10.9
Fundulus heteroclites		11	.	.	3.7	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	7	.	11	1.9	.	1.0
Belastoma spp.		7	.	.	1.7	.	.

(continued)

APPENDIX TABLE B-13. (continued)

		Frequency occurrence			Aggregate percent[a]		
Scientific name	Common name	Gizzard (55)	Gullet (2)	Unknown (128)	Gizzard (55)	Gullet (2)	Unknown (128)
Hydrobia spp. (Littoridinops)	swamp snail	11	.	8	1.7	.	0.3
Chironomidae	midge	2	.	.	1.1	.	.
Fundulus spp.		5	.	4	1.1	.	1.3
Libelluidae	common skimmer	9	.	2	0.8	.	0.2
Macoma balthica	Baltic macoma	2	.	13	0.7	.	2.9
Cyprinodontidae	top minnow	11	.	.	0.7	.	.
Xanthidae (Pilumnidae)	mud crab	7	.	1	0.5	.	0.0
	undetermined fish	4	.	5	0.5	.	1.4
Bittium alternatum (B. nigrum)	alternate bittium	5	.	2	0.5	.	0.0
Mollusca	mollusk	2	.	.	0.5	.	.
Gammarus spp.	scud	5	.	1	0.5	.	0.2
Menidia spp.	silverside	2	.	.	0.2	.	.
Corixidae	water boatman	22	.	6	0.1	.	0.0
Tropisternus spp.		13	.	2	0.1	.	0.3
Amnicoliidae (Bulimidae)	swamp snail	4	.	1	0.1	.	0.0
Tellina spp.	dwarf tellin	5	.	.	0.1	.	.
Paneopeus spp.	mud crab	2	.	2	0.1	.	0.5
Tachistodes spp.		2	.	.	0.1	.	.
Aeschnidae	darner	4	.	.	0.1	.	.
Hydrophilidae	water scavenger beetle	2	.	5	0.1	.	0.1
Anguilla rostrata	American eel	2	.	.	0.1	.	.
Odontomyia spp.		2	.	.	0.1	.	.
Graphoderes spp.		2	.	.	0.0	.	.
Lycosidae	wolf spider	2	.	.	0.0	.	.
Amphipoda	scud, sideswimmer	2	.	7	0.0	.	0.2
Hyalella spp.	amphipod	2	.	.	0.0	.	.
Rhithropaneopeus harrisi	white-fingered mud crab	2	.	.	0.0	.	.
Odostomia spp.	odostome	2	.	.	0.0	.	.
Odostomia trifida	tripartite odostome	2	.	1	0.0	.	0.0
Amnicola spp.	amnicola	4	.	.	0.0	.	.
Pelecypoda (Bivalvia)	bivalve	4	.	1	0.0	.	0.0
Brachiodontes recurvus (Mytilus)	hooked mussel	2	.	5	0.0	.	0.8
Gemma gemma	gem clam	2	.	5	0.0	.	0.1
Nereidae	clam worm	5	.	.	0.0	.	.
Nereis spp.	clam worm	2	.	5	0.0	.	0.2
Isopoda	isopod	2	.	2	0.0	.	0.0
Asellidae	aquatic sowbug	2	.	.	0.0	.	.
Orchestia spp.	amphipod	2	.	.	0.0	.	.
Decapoda	crayfish, shrimp	2	.	2	0.0	.	0.0
Podocopa	ostracod	5	.	2	0.0	.	0.0
Haliplidae	crawling water beetle	2	.	.	0.0	.	.
Dytiscidae	predaceous diving beetle	4	.	2	0.0	.	0.0
Curculionidae	snout beetle	4	50	3	0.0	0.0	0.0

(continued)

APPENDIX TABLE B-13. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (55)	Frequency occurrence Gullet (2)	Frequency occurrence Unknown (128)	Aggregate percent[a] Gizzard (55)	Aggregate percent[a] Gullet (2)	Aggregate percent[a] Unknown (128)
Sphenophorus spp.	billbug	2	.	7	0.0	.	0.0
Enochrus spp.		4	.	4	0.0	.	0.2
Berosus spp.		2	.	5	0.0	.	0.2
Formicidae	ant	4	.	2	0.0	.	0.1
Anisoptera	dragonfly	2	.	2	0.0	.	0.1
Araneae	spider	7	.	2	0.0	.	0.0
Poeciliidae		2	.	.	0.0	.	.
	Total animal material	69	50	68	25.9	0.0	27.0
Ulva lactuca	sea lettuce	.	.	1	.	.	0.5
Pinus spp.	pine	.	.	1	.	.	0.0
Juniperus virginiana	red cedar	.	.	1	.	.	0.0
Potamogeton epihydrus	ribbonleaf pondweed	.	.	1	.	.	0.0
Elodea canadensis	common elodea	.	.	1	.	.	0.2
Scirpus americanus	common threesquare	.	.	4	.	.	0.3
Scirpus fluviatilis	river bulrush	.	.	1	.	.	0.0
Carex lurida	sedge	.	.	1	.	.	0.0
Carex crinita	sedge	.	.	1	.	.	0.0
Eleusine indica	yard grass	.	.	1	.	.	0.0
Paspalum spp.	grass	.	50	.	.	0.0	.
Spartina cynosuroides	big cordgrass	.	.	2	.	.	0.1
Spartina patens	saltmeadow cordgrass	.	.	1	.	.	0.3
Andropogon spp.	beard grass	.	.	1	.	.	0.0
Triticum aestivum	wheat	.	.	1	.	.	0.7
Peltandra virginica	arrow arum	.	.	2	.	.	1.0
Pontederia cordata	pickerel weed (tuckahoe)	.	.	2	.	.	0.1
Myrica spp.	wax-myrtle	.	.	3	.	.	0.0
Celtis spp.	elm	.	.	1	.	.	0.0
Chenopodium spp.	goosefoot	.	.	2	.	.	0.0
Atriplex patula	spearscale	.	.	2	.	.	0.0
Amaranthus spp.	amaranth	.	.	1	.	.	0.0
Rumex spp.	dock, sorrel	.	.	1	.	.	0.0
Rumex crispus	sour dock	.	.	1	.	.	0.0
Polygonum densiflorum	southern smartweed	.	.	1	.	.	0.0
Phytolacca americana	pokeweed	.	.	1	.	.	0.0
Lespedeza stipulacea	Korean lespedeza	.	.	1	.	.	0.0
Medicago lupulina	black medick	.	.	1	.	.	0.0
Melilotus spp.	sweet clover	.	.	1	.	.	0.0
Rhus spp.	cashew	.	.	3	.	.	0.0
Rhus Copallinum	sumac	.	.	1	.	.	0.0
Vitis spp.	grape, wild grape	.	.	1	.	.	0.0
Hibiscus Moscheutos	rose-mallow	.	.	1	.	.	0.1
Teucrium canadense	germander (wood sage)	.	.	1	.	.	0.0
Trichostema spp.	blue curls	.	.	2	.	.	0.1

(continued)

APPENDIX TABLE B-13. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (55)	Frequency occurrence Gullet (2)	Frequency occurrence Unknown (128)	Aggregate percent[a] Gizzard (55)	Aggregate percent[a] Gullet (2)	Aggregate percent[a] Unknown (128)
Nyssa spp.	sour gum	.	.	1	.	.	0.0
Nyssa sylvatica (biflora)	black gum (sour gum)	.	.	2	.	.	0.1
Ceratophyllum demersum	hornwort	.	.	1	.	.	0.4
Ambrosia artemisiifolia	ragweed	.	.	2	.	.	0.0
Iva frutescens	marsh-elder	.	.	13	.	.	2.9
Baccharis halimifolia	groundsel tree	.	.	2	.	.	0.2
Nuphar advena	yellow water lily	.	.	1	.	.	0.0
Juncus spp.	rush	.	.	1	.	.	0.0
Juncus Roemerianus	needlerush	.	.	2	.	.	0.1
Limonium spp.	sea-lavender	.	.	1	.	.	0.6
Ruppia maritima	widgeongrass	58	.	69	20.7	.	21.7
Scirpus Olneyi	olney threesquare	51	.	48	9.6	.	7.0
Polygonum punctatum	dotted smartweed	25	.	11	6.4	.	3.9
Cladium mariscoides	twig-rush	51	.	20	4.9	.	1.7
Spartina alterniflora (stricta)	saltmarsh cordgrass	16	.	5	4.7	.	1.2
	undetermined vegetation	11	.	6	4.3	.	1.3
Zea mays	corn	5	50	16	3.7	46.0	10.8
Distichlis spicata	salt grass	13	50	19	2.9	4.0	2.5
Zizania aquatica	wildrice	5	.	.	2.7	.	.
Echinochloa Walteri		11	.	4	2.4	.	0.0
Enteromorpha clathrata	filamentous green alga	4	.	1	2.3	.	0.6
Sparganium androcladum	shining burreed	5	.	.	1.1	.	.
Potamogeton perfoliatus	redhead grass	2	.	20	1.1	.	6.0
Panicum spp.	panic grass	2	50	2	0.9	0.0	0.0
Polygonum spp.	smartweed	4	.	1	0.7	.	0.0
Gramineae	grasses	4	.	2	0.7	.	0.0
Zostera marina	eelgrass	2	50	11	0.5	50.0	3.3
Polygonum arifolium	halberdleaf tear-thumb	5	.	6	0.5	.	1.0
Scirpus spp.	bulrush	5	.	2	0.4	.	0.0
Ilex verticillata	black alder (winterberry)	4	.	.	0.4	.	.
Cephalanthus occidentalis	buttonbush	5	.	1	0.4	.	0.0
Chara spp.	muskgrass	4	.	1	0.4	.	0.7
Potamogeton spp.	pondweed	2	.	2	0.4	.	0.0
Eleocharis palustris	common spikerush	2	.	1	0.3	.	0.0
Scirpus robustus	saltmarsh bulrush	33	.	27	0.3	.	1.1
Ilex decidua	holly	2	.	.	0.3	.	.
Polygonum sagittatum	smartweed	4	.	.	0.2	.	.
Zosteraceae	pondweed	2	.	1	0.2	.	0.0
Polygonum Hydropiper	smartweed	2	.	.	0.1	.	.
Polygonum pensylvanicum	smartweed	5	.	1	0.1	.	0.0
Cuscuta spp.	dodder	5	.	13	0.1	.	0.1
Rubus spp.	bramble	4	.	4	0.1	.	0.0
Scirpus validus	softstem bulrush	4	.	10	0.1	.	0.3

(continued)

APPENDIX TABLE B-13. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (55)	Frequency occurrence Gullet (2)	Frequency occurrence Unknown (128)	Aggregate percent[a] Gizzard (55)	Aggregate percent[a] Gullet (2)	Aggregate percent[a] Unknown (128)
Myrica cerifera	wax-myrtle	20	.	.	0.1	.	.
Carex spp.	sedge	2	.	.	0.0	.	.
Magnolia virginiana	sweet bay (swamp bay)	2	.	.	0.0	.	.
Sparganium americanum	eastern burreed	4	.	7	0.0	.	0.3
Cyperus spp.	galingale	2	.	.	0.0	.	.
Smilax spp.	lily	2	.	2	0.0	.	0.0
Rhus glabra	smooth sumac	2	.	.	0.0	.	.
Gerardia maritima	seaside gerardia	2	.	.	0.0	.	.
Enteromorpha spp.	filamentous green algae	4	.	.	0.0	.	.
Pinus Taeda	loblolly pine	5	.	.	0.0	.	.
Potamogeton pectinatus	sago pondweed	5	.	11	0.0	.	1.3
Potamogeton pusillus	slender pondweed	4	.	.	0.0	.	.
Zannichellia palustris	horned pondweed	2	.	1	0.0	.	0.0
Sparganium spp.	burreed	2	.	1	0.0	.	0.0
Eleocharis spp.	spikerush	4	.	1	0.0	.	0.0
Eleocharis quadrangulata	squarestem spikerush	4	.	.	0.0	.	.
Scirpus pallidus	black bulrush	2	.	.	0.0	.	.
Fimbristylis castanea	saltmarsh fimbristylis	2	.	1	0.0	.	0.0
Leersia oryzoides	cut grass	4	.	1	0.0	.	0.0
Setaria italica	millet	2	.	.	0.0	.	.
Spartina spp.	cordgrass	2	.	5	0.0	.	0.3
Carpinus caroliniana	hornbeam (blue beech)	2	.	.	0.0	.	.
Salicornia Bigelovii (musronata)	glasswort (samphire)	2	.	.	0.0	.	.
Acnida cannabinus (amaranthus)	tidemarsh waterhemp	2	.	3	0.0	.	0.0
Proserpinaca palustris	marsh mermaidweed	2	.	.	0.0	.	.
Cornus spp.	dogwood	2	.	.	0.0	.	.
	Total plant material	96	100	99	74.1	100.0	73.0

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-14. FOOD ITEMS OF GADWALLS IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

Scientific name	Common name	Frequency occurrence Gizzard (7)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (21)	Aggregate percent[a] Gizzard (7)	Aggregate percent[a] Gullet (.)	Aggregate percent[a] Unknown (21)
Berosus spp.		.	.	5	.	.	0.0
	undetermined fish	.	.	5	.	.	1.0
Gemma gemma	gem clam	14	.	.	0.0	.	.
	Total animal material	14	.	10	0.0	.	1.0
Rhodophyceae	red algae	.	.	5	.	.	1.9
Chlorophyceae	green algae	.	.	5	.	.	4.0
Zostera marina	eelgrass	.	.	14	.	.	8.4
Potamogeton perfoliatus	redhead grass	.	.	10	.	.	4.8
Najas spp.	naiad	.	.	19	.	.	17.1
Elodea canadensis	common elodea	.	.	5	.	.	1.0
Scirpus americanus	common threesquare	.	.	5	.	.	0.0
Scirpus robustus	saltmarsh bulrush	.	.	5	.	.	0.0
Scirpus validus	softstem bulrush	.	.	5	.	.	0.0
Gramineae	grasses	.	.	10	.	.	1.9
Spartina spp.	cordgrass	.	.	10	.	.	7.6
Acnida cannabinus (amaranthus)	tidemarsh waterhemp	.	.	5	.	.	0.0
Myriophyllum spp.	watermilfoil	.	.	5	.	.	4.8
Ruppia maritima	widgeongrass	86	.	67	56.6	.	41.8
Chara spp.	muskgrass	14	.	10	14.1	.	2.9
Potamogeton pusillus	slender pondweed	14	.	5	12.9	.	2.9
Distichlis spicata	salt grass	14	.	.	12.9	.	.
Scirpus Olneyi	olney threesquare	29	.	.	2.1	.	.
Potamogeton spp.	pondweed	14	.	.	1.4	.	.
Cladium mariscoides	twig-rush	14	.	.	0.0	.	.
Myrica cerifera	wax-myrtle	14	.	.	0.0	.	.
	Total plant material	100	.	100	100.0	.	99.0

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-15. FOOD ITEMS OF MALLARDS IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (25)	Gullet (2)	Unknown (41)	Gizzard (25)	Gullet (2)	Unknown (41)
Bittium varium	variable bittium	.	.	2	.	.	0.0
Hydrobia spp. (Littoridinops)	swamp snail	.	.	5	.	.	0.0
Macoma balthica	Baltic macoma	.	.	2	.	.	0.1
Chiridotea caeca	isopod	.	.	2	.	.	0.5
Decapoda	crayfish, shrimp	.	50	2	.	10.0	0.0
Insecta	insect	.	.	10	.	.	0.0
Sphenophorus spp.	billbug	.	.	2	.	.	0.0
	undetermined fish	.	.	2	.	.	1.2
Urochordata (Tunicata)		.	.	2	.	.	2.4
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	4	50	5	0.4	17.5	2.4
Arthropoda		4	.	.	0.2	.	.
Gammarus spp.	scud	4	.	.	0.2	.	.
Melampus bidentatus	salt marsh snail	4	.	2	0.2	.	0.0
Pelecypoda (Bivalvia)	bivalve	8	.	.	0.1	.	.
Mollusca	mollusk	4	.	.	0.0	.	.
Gastropoda	snail, limpet	4	.	2	0.0	.	0.0
Mytilidae	mussel	4	.	.	0.0	.	.
Nereidae	clam worm	4	.	.	0.0	.	.
Coleoptera	beetle	4	.	.	0.0	.	.
Formicidae	ant	4	.	.	0.0	.	.
Lasius spp.	field ant	4	.	.	0.0	.	.
Araneae	spider	4	.	.	0.0	.	.
	Total animal material	24	50	32	1.1	27.5	6.9
Zostera marina	eelgrass	.	.	2	.	.	2.2
Vallisneria americana (spiralis)	wildcelery	.	.	2	.	.	0.1
Sparganium eurycarpum	big burreed	.	.	7	.	.	1.8
Cyperus spp.	galingale	.	.	2	.	.	0.0
Eleocharis spp.	spikerush	.	.	2	.	.	0.0
Eleocharis palustris	common spikerush	.	.	5	.	.	0.0
Scirpus fluviatilis	river bulrush	.	.	5	.	.	0.0
Echinochloa Walteri		.	.	10	.	.	0.4
Spartina spp.	cordgrass	.	.	7	.	.	2.7
Spartina alterniflora (stricta)	saltmarsh cordgrass	.	.	5	.	.	2.2
Triticum aestivum	wheat	.	.	2	.	.	2.0
Peltandra virginica	arrow arum	.	.	7	.	.	2.0
Pontederia cordata	pickerel weed (tuckahoe)	.	.	5	.	.	0.0
Amaranthus spp.	amaranth	.	.	2	.	.	0.0
Acnida cannabinus (amaranthus)	tidemarsh waterhemp	.	.	2	.	.	0.0
Phytolacca americana	pokeweed	.	.	2	.	.	0.0
Agrostemma Githago	corn-cockle	.	.	2	.	.	0.1
Rosa spp.	rose	.	.	7	.	.	0.1
Rhus spp.	cashew	.	.	2	.	.	0.0

(continued)

APPENDIX TABLE B-15. (continued)

		Frequency occurrence			Aggregate percent[a]		
Scientific name	Common name	Gizzard (25)	Gullet (2)	Unknown (41)	Gizzard (25)	Gullet (2)	Unknown (41)
Rhus radicans	poison ivy - poison oak	.	.	2	.	.	0.0
Ilex spp.	holly	.	.	5	.	.	0.1
Vitis spp.	grape, wild grape	.	.	7	.	.	1.6
Nyssa sylvatica (biflora)	black gum (sour gum)	.	.	5	.	.	0.5
Ambrosia artemisiifolia	ragweed	.	.	2	.	.	0.0
Brasenia Schreberi	watershield	.	.	2	.	.	0.0
Zea mays	corn	16	.	20	14.5	.	16.8
Ruppia maritima	widgeongrass	32	50	37	14.4	17.5	16.2
Scirpus spp.	bulrush	32	.	5	11.6	.	2.9
Gramineae	grasses	16	.	.	6.7	.	.
Polygonum arifolium	halberdleaf tear-thumb	12	.	17	5.6	.	3.3
Polygonum spp.	smartweed	24	.	.	4.9	.	.
Polygonum Hydropiper	smartweed	8	.	.	4.7	.	.
Cladium mariscoides	twig-rush	20	50	20	4.4	5.0	1.8
Polygonum sagittatum	smartweed	20	.	.	4.0	.	.
	undetermined vegetation	20	.	5	3.3	.	2.7
Cyperaceae	sedge	4	.	.	3.0	.	.
Distichlis spicata	salt grass	4	50	7	3.0	1.5	2.7
Panicum spp.	panic grass	4	.	.	2.4	.	.
Zizania aquatica	wildrice	4	.	.	2.4	.	.
Carex spp.	sedge	8	.	.	2.2	.	.
Sparganium americanum	eastern burreed	8	50	15	1.7	5.0	0.3
Carex lurida	sedge	4	.	.	1.6	.	.
Potamogeton spp.	pondweed	12	.	.	1.2	.	.
Sparganium spp.	burreed	8	.	.	1.0	.	.
Scirpus Olneyi	olney threesquare	16	50	41	0.8	1.0	4.2
Zosteraceae	pondweed	4	.	.	0.6	.	.
Potamogeton pusillus	slender pondweed	4	.	.	0.6	.	.
Scirpus validus	softstem bulrush	8	.	34	0.6	.	2.4
Potamogeton perfoliatus	redhead grass	4	.	15	0.4	.	4.1
Zannichellia palustris	horned pondweed	4	.	.	0.4	.	.
Iva frutescens	marsh-elder	4	.	5	0.4	.	1.7
Cephalanthus occidentalis	buttonbush	8	.	.	0.4	.	.
Sparganium androcladum	shining burreed	8	.	.	0.3	.	.
Scirpus americanus	common threesquare	8	.	24	0.2	.	2.8
Polygonum hydropiperoides	swamp smartweed	4	.	.	0.2	.	.
Polygonum pensylvanicum	smartweed	4	50	5	0.2	2.5	0.4
Ilex verticillata	black alder (winterberry)	4	.	.	0.2	.	.
Cuscuta spp.	dodder	8	.	12	0.2	.	0.0
Spartina cynosuroides	big cordgrass	4	.	2	0.1	.	1.2
Smilax spp.	lily	4	.	.	0.1	.	.
Myrica cerifera	wax-myrtle	4	.	.	0.1	.	.
Ilex decidua	holly	4	.	.	0.1	.	.

(continued)

APPENDIX TABLE B-15. (continued)

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (25)	Gullet (2)	Unknown (41)	Gizzard (25)	Gullet (2)	Unknown (41)
Hibiscus Moscheutos	rose-mallow	4	.	.	0.1	.	.
Polygonum punctatum	dotted smartweed	12	50	29	0.1	12.5	5.8
Chara spp.	muskgrass	4	50	5	0.0	25.0	0.9
Pinus Taeda	loblolly pine	4	.	.	0.0	.	.
Juniperus virginiana	red cedar	8	.	.	0.0	.	.
Potamogeton pectinatus	sago pondweed	4	50	2	0.0	2.5	2.0
Scirpus robustus	saltmarsh bulrush	4	.	22	0.0	.	2.7
Leersia oryzoides	cut grass	4	.	.	0.0	.	.
Rhus glabra	smooth sumac	4	.	.	0.0	.	.
Proserpinaca palustris	marsh mermaidweed	4	.	.	0.0	.	.
Pinus spp.	pine	4	.	.	0.0	.	.
Eleocharis quadrangulata	squarestem spikerush	4	.	.	0.0	.	.
Paspalum spp.	grass	4	.	.	0.0	.	.
Andropogon spp.	beard grass	8	.	.	0.0	.	.
Myrica spp.	wax-myrtle	4	.	12	0.0	.	1.2
Rumex spp.	dock, sorrel	4	.	5	0.0	.	1.2
Rosa palustris	swamp rose	4	.	.	0.0	.	.
Juncus spp.	rush	4	.	.	0.0	.	.
	Total plant material	100	100	95	98.9	72.5	93.1

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE B-16. FOOD ITEMS OF PINTAILS IN CHESAPEAKE BAY DURING THE PERIOD 1890 - 1959

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (13)	Gullet (.)	Unknown (36)	Gizzard (13)	Gullet (.)	Unknown (36)
Sayella chesapeakea	snail	.	.	3	.	.	0.0
Pleuroceridae	river snail	.	.	3	.	.	0.0
Goniobasis virginica	snail	.	.	3	.	.	0.0
Triphora nigrocincta (Triforis)	black triphora	.	.	3	.	.	0.0
Retusa canaliculata (Acteocina)	channeled barrel bubble	.	.	3	.	.	0.0
Amnicola spp.	amnicola	.	.	3	.	.	0.0
Mytilidae	mussel	.	.	3	.	.	0.0
Modiolus spp. (Volsella)	mussel	.	.	3	.	.	0.0
Gemma gemma	gem clam	.	.	6	.	.	0.0
Macoma mitchelli (M. phenax)	Mitchell's clam	.	.	3	.	.	0.0
Nereidae	clam worm	.	.	6	.	.	0.0
Nereis spp.	clam worm	.	.	3	.	.	0.0
Cyathura carinata (polita)	isopod	.	.	3	.	.	0.3
Erichsonella spp.	isopod	.	.	3	.	.	0.1
Amphipoda	scud, sideswimmer	.	.	3	.	.	0.1
Insecta	insect	.	.	3	.	.	0.0
Coleoptera	beetle	.	.	3	.	.	0.0
Curculionidae	snout beetle	.	.	3	.	.	0.0
Pentatomidae	stink bug	.	.	3	.	.	0.0
Hymenoptera	bee, wasp, ant	.	.	3	.	.	0.0
Lepidoptera	butterfly, moth	.	.	3	.	.	0.0
Anisoptera	dragonfly	.	.	3	.	.	0.1
Decapoda	crayfish, shrimp	8	.	.	6.0	.	.
Melampus bidentatus	salt marsh snail	8	.	6	4.6	.	0.0
Molgula manhattensis	sea grape	8	.	.	3.8	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	8	.	6	0.8	.	0.0
Nassarius vibex	mottled dog whelk	15	.	.	0.4	.	.
Bittium varium	variable bittium	8	.	3	0.3	.	1.7
Anachis avara	greedy dove shell	8	.	.	0.3	.	.
Mytilus edulis	blue mussel	8	.	.	0.3	.	.
Bittium alternatum (B. nigrum)	alternate bittium	8	.	.	0.2	.	.
Nassarius obsoletus (Nyanassa)	mud dog whelk	15	.	.	0.2	.	.
Gastropoda	snail, limpet	8	.	.	0.0	.	.
Nassarius spp.	dog whelk	8	.	3	0.0	.	0.0
Dytiscidae	predaceous diving beetle	8	.	.	0.0	.	.
	Total animal material	54	.	22	16.8	.	2.5
Potamogeton spp.	pondweed	.	.	6	.	.	0.0
Potamogeton perfoliatus	redhead grass	.	.	8	.	.	0.7
Zannichellia palustris	horned pondweed	.	.	3	.	.	0.0
Elodea canadensis	common elodea	.	.	3	.	.	1.4
Sparganium americanum	eastern burreed	.	.	8	.	.	0.6
Eleocharis obtusa	blunt spikerush	.	.	3	.	.	0.0

(continued)

APPENDIX TABLE B-16. (continued)

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (13)	Gullet (.)	Unknown (36)	Gizzard (13)	Gullet (.)	Unknown (36)
Scirpus Olneyi	olney threesquare	.	.	11	.	.	2.9
Scirpus robustus	saltmarsh bulrush	.	.	6	.	.	0.0
Scirpus validus	softstem bulrush	.	.	11	.	.	1.0
Carex spp.	sedge	.	.	3	.	.	0.0
Digitaria sanguinalis	crab grass	.	.	3	.	.	0.0
Echinochloa crusgalli	barnyard grass	.	.	3	.	.	0.0
Panicum spp.	panic grass	.	.	11	.	.	0.5
Paspalum spp.	grass	.	.	3	.	.	0.0
Setaria spp.	foxtail grass	.	.	11	.	.	0.6
Setaria italica	millet	.	.	6	.	.	3.7
Spartina cynosuroides	big cordgrass	.	.	3	.	.	0.1
Distichlis spicata	salt grass	.	.	6	.	.	0.4
Chenopodium spp.	goosefoot	.	.	3	.	.	0.0
Amaranthus spp.	amaranth	.	.	8	.	.	0.0
Polygonum arifolium	halberdleaf tear-thumb	.	.	6	.	.	0.4
Polygonum lapathifolium	nodding smartweed	.	.	6	.	.	0.4
Polygonum pensylvanicum	smartweed	.	.	14	.	.	3.6
Polygonum Persicaria	smartweed	.	.	11	.	.	2.8
Polygonum punctatum	dotted smartweed	.	.	8	.	.	6.3
Polygonum coccineum	marsh smartweed	.	.	3	.	.	0.4
Rubus spp.	bramble	.	.	3	.	.	0.0
Rhus Copallinum	sumac	.	.	3	.	.	0.0
Cuscuta spp.	dodder	.	.	3	.	.	0.0
Cephalanthus occidentalis	buttonbush	.	.	6	.	.	2.1
Nyssa sylvatica (biflora)	black gum (sour gum)	.	.	6	.	.	0.3
Ambrosia spp.	ragweed	.	.	3	.	.	0.0
Zea mays	corn	54	.	58	53.6	.	48.1
Potamogeton pectinatus	sago pondweed	15	.	.	11.4	.	.
Ruppia maritima	widgeongrass	54	.	44	6.3	.	13.5
Scirpus americanus	common threesquare	8	.	17	3.8	.	0.5
Echinochloa spp.		8	.	.	3.1	.	.
Spartina alterniflora (stricta)	saltmarsh cordgrass	8	.	17	2.7	.	0.3
Panicum dichotomiflorum	panic grass	8	.	8	0.8	.	0.8
Cladium mariscoides	twig-rush	15	.	17	0.5	.	0.9
Digitaria spp.	crab grass	8	.	14	0.4	.	4.3
Myrica spp.	wax-myrtle	8	.	3	0.4	.	0.0
Zostera marina	eelgrass	15	.	.	0.2	.	.
Eleocharis spp.	spikerush	8	.	.	0.0	.	.
Eleocharis quadrangulata	squarestem spikerush	8	.	.	0.0	.	.
Scirpus spp.	bulrush	8	.	.	0.0	.	.
Gramineae	grasses	8	.	3	0.0	.	0.8
Myrica carolinensis	wax-myrtle	8	.	8	0.0	.	0.0
Myrica cerifera	wax-myrtle	8	.	3	0.0	.	0.0

(continued)

APPENDIX TABLE B-16. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (13)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (36)	Aggregate percent[a] Gizzard (13)	Aggregate percent[a] Gullet (.)	Aggregate percent[a] Unknown (36)
Bidens spp.	beggar-tick	8	.	.	0.0	.	.
	Total plant material	100	.	100	83.2	.	97.5

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE C-1. FOOD ITEMS OF CANADA GEESE IN CHESAPEAKE BAY DURING THE PERIOD 1960 - 1969[a]

Scientific name	Common name	Frequency occurrence Gizzard (221)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (.)	Aggregate percent[b] Gizzard (221)	Aggregate percent[b] Gullet (.)	Aggregate percent[b] Unknown (.)
Gramineae	grasses	36	.	.	32.4	.	.
Zea mays	corn	36	.	.	29.6	.	.
Myriophyllum spicatum	Eurasian watermilfoil	10	.	.	7.0	.	.
Trifolium repens	white clover	7	.	.	5.1	.	.
Digitaria sanguinalis	crab grass	9	.	.	3.0	.	.
Potamogeton perfoliatus	redhead grass	5	.	.	2.7	.	.
Triticum aestivum	wheat	4	.	.	2.6	.	.
Najas guadalupensis	southern naiad	3	.	.	2.1	.	.
Digitaria filiformis	crab grass	3	.	.	1.5	.	.
Cyperus esculentus	galingale	3	.	.	1.5	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	4	.	.	1.3	.	.
Ruppia maritima	widgeongrass	2	.	.	1.2	.	.
Ulva lactuca	sea lettuce	1	.	.	0.9	.	.
Spartina patens	saltmeadow cordgrass	1	.	.	0.9	.	.
Glycine Max	soy bean	0	.	.	0.8	.	.
Panicum dichotomiflorum	panic grass	3	.	.	0.8	.	.
Spartina cynosuroides	big cordgrass	1	.	.	0.8	.	.
Hordeum vulgare	barley	1	.	.	0.8	.	.
Setaria geniculata	foxtail grass	1	.	.	0.6	.	.
Cladium mariscoides	twig-rush	1	.	.	0.6	.	.
Polygonum pensylvanicum	smartweed	4	.	.	0.6	.	.
Ceratophyllum demersum	hornwort	1	.	.	0.5	.	.
Scirpus validus	softstem bulrush	2	.	.	0.4	.	.
Zostera marina	eelgrass	0	.	.	0.3	.	.
Setaria Faberii	foxtail grass	3	.	.	0.3	.	.
Ipomoea hederacea	morning glory	2	.	.	0.3	.	.
Avena sativa	oats	0	.	.	0.2	.	.
Echinochloa crusgalli	barnyard grass	1	.	.	0.2	.	.
Bidens laevis	beggar-tick	0	.	.	0.2	.	.
Polygonum lapathifolium	nodding smartweed	0	.	.	0.2	.	.
Polygonum Persicaria	smartweed	1	.	.	0.1	.	.
Albizia Julibrissin	acacia (silk-tree)	0	.	.	0.1	.	.
Prunus serotina	wild cherry (black cherry)	0	.	.	0.1	.	.
Solanum carolinense	horse-nettle	0	.	.	0.1	.	.
Leersia oryzoides	cut grass	0	.	.	0.0	.	.
Setaria viridis	foxtail grass	0	.	.	0.0	.	.
Myrica cerifera	wax-myrtle	0	.	.	0.0	.	.
Cornus florida	flowering dogwood	0	.	.	0.0	.	.
Nyssa biflora	water gum	0	.	.	0.0	.	.
Ambrosia artemisiifolia	ragweed	1	.	.	0.0	.	.
Datura stramonium	jimson-weed	0	.	.	0.0	.	.
Eleusine indica	yard grass	0	.	.	0.0	.	.

(continued)

APPENDIX TABLE C-1. (continued)[a]

Scientific name	Common name	Frequency occurrence Gizzard (221)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (.)	Aggregate percent[b] Gizzard (221)	Aggregate percent[b] Gullet (.)	Aggregate percent[b] Unknown (.)
Polygonum punctatum	dotted smartweed	1	.	.	0.0	.	.
Rhus radicans	poison ivy - poison oak	0	.	.	0.0	.	.
Vitis aestivalis	summer-grape	0	.	.	0.0	.	.
	Total plant material	.	.	.	100.0	.	.

[a] Unpublished data from Rawls (in prep.).

[b] As defined by Swanson et al. (1974).

APPENDIX TABLE C-2. FOOD ITEMS OF BUFFLEHEADS IN CHESAPEAKE BAY DURING THE PERIOD 1960 - 1969[a]

Scientific name	Common name	Frequency occurrence Gizzard (27)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (.)	Aggregate percent[b] Gizzard (27)	Aggregate percent[b] Gullet (.)	Aggregate percent[b] Unknown (.)
Balanus spp.	barnacle	22	.	.	10.0	.	.
	undetermined fish	11	.	.	8.5	.	.
Rhithropaneopeus harrisi	white-fingered mud crab	22	.	.	7.2	.	.
Mya arenaria	soft-shelled clam	26	.	.	7.0	.	.
Isopoda	isopod	15	.	.	5.9	.	.
Pelecypoda (Bivalvia)	bivalve	7	.	.	4.8	.	.
Macoma balthica	Baltic macoma	7	.	.	4.8	.	.
Macoma mitchelli (M. phenax)	Mitchell's clam	19	.	.	4.8	.	.
Congeria leucophaeta	Conrad's false mussel	15	.	.	3.8	.	.
Mulinia lateralis	duck clam	4	.	.	2.6	.	.
Odostomia impressa	incised odostome	15	.	.	2.0	.	.
Annelida	leech, polychaete	4	.	.	1.5	.	.
Gammarus spp.	scud	4	.	.	1.5	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	11	.	.	1.3	.	.
Retusa canaliculata (Acteocina)	channeled barrel bubble	4	.	.	0.9	.	.
Amphipoda	scud, sideswimmer	15	.	.	0.6	.	.
Brachiodontes recurvus (Mytilus)	hooked mussel	7	.	.	0.4	.	.
Hydrobiidae		4	.	.	0.2	.	.
Edotea triloba	isopod	4	.	.	0.2	.	.
Gastropoda	snail, limpet	4	.	.	0.0	.	.
Sayella chesapeakea	snail	4	.	.	0.0	.	.
Insecta	insect	4	.	.	0.0	.	.
Membranipora spp.	bryozoan	4	.	.	0.0	.	.
	Total animal material	.	.	.	68.0	.	.
Ruppia maritima	widgeongrass	56	.	.	13.5	.	.
Potamogeton perfoliatus	redhead grass	52	.	.	11.8	.	.
Najas guadalupensis	southern naiad	4	.	.	3.0	.	.
Scirpus validus	softstem bulrush	11	.	.	3.0	.	.
Potamogeton pusillus	slender pondweed	4	.	.	0.4	.	.
Zannichellia palustris	horned pondweed	4	.	.	0.4	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	4	.	.	0.4	.	.
Myriophyllum spicatum	Eurasian watermilfoil	7	.	.	0.2	.	.
Cladium mariscoides	twig-rush	4	.	.	0.0	.	.
	Total plant material	.	.	.	32.6	.	.

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[a] Unpublished data from Rawls (in prep.).

[b] As defined by Swanson et al. (1974).

APPENDIX TABLE C-3. FOOD ITEMS OF COMMON GOLDENEYES IN CHESAPEAKE BAY DURING THE PERIOD 1960 - 1969[a]

Scientific name	Common name	Frequency occurrence			Aggregate percent[b]		
		Gizzard (45)	Gullet (.)	Unknown (.)	Gizzard (45)	Gullet (.)	Unknown (.)
Rhithropaneopeus harrisi	white-fingered mud crab	33	.	.	19.4	.	.
Mya arenaria	soft-shelled clam	33	.	.	14.9	.	.
Balanus spp.	barnacle	20	.	.	9.2	.	.
Pelecypoda (Bivalvia)	bivalve	27	.	.	9.0	.	.
Congeria leucophaeta	Conrad's false mussel	2	.	.	2.1	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	13	.	.	1.4	.	.
Macoma mitchelli (M. phenax)	Mitchell's clam	7	.	.	1.1	.	.
Cyathura polita	isopod	4	.	.	1.0	.	.
Amphipoda	scud, sideswimmer	2	.	.	1.0	.	.
Gastropoda	snail, limpet	2	.	.	0.9	.	.
Paneopeus spp.	mud crab	4	.	.	0.8	.	.
Macoma balthica	Baltic macoma	2	.	.	0.7	.	.
Membranipora spp.	bryozoan	2	.	.	0.7	.	.
Odostomia impressa	incised odostome	4	.	.	0.4	.	.
Eurypanopeus depressus	mud crab	7	.	.	0.3	.	.
Brachiodontes recurvus (Mytilus)	hooked mussel	2	.	.	0.1	.	.
	Total animal material	.	.	.	63.1	.	.
Zea mays	corn	31	.	.	17.7	.	.
Ruppia maritima	widgeongrass	33	.	.	7.3	.	.
Ceratophyllum demersum	hornwort	4	.	.	3.9	.	.
Scirpus robustus	saltmarsh bulrush	2	.	.	2.2	.	.
Potamogeton perfoliatus	redhead grass	7	.	.	1.1	.	.
Scirpus validus	softstem bulrush	2	.	.	1.1	.	.
Myriophyllum spicatum	Eurasian watermilfoil	2	.	.	1.1	.	.
Ulva lactuca	sea lettuce	2	.	.	0.6	.	.
Robinia Psuedoacacia	black locust	2	.	.	0.4	.	.
Najas guadalupensis	southern naiad	2	.	.	0.3	.	.
Vallisneria americana (spiralis)	wildcelery	2	.	.	0.3	.	.
Nyssa biflora	water gum	2	.	.	0.3	.	.
Potamogeton pusillus	slender pondweed	2	.	.	0.2	.	.
Vitis spp.	grape, wild grape	2	.	.	0.2	.	.
Potamogeton pectinatus	sago pondweed	2	.	.	0.0	.	.
Gramineae	grasses	4	.	.	0.0	.	.
	Total plant material	.	.	.	36.9	.	.

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[a] Unpublished data from Rawls (in prep.).

[b] As defined by Swanson et al. (1974).

APPENDIX TABLE C-4. FOOD ITEMS OF CANVASBACKS IN CHESAPEAKE BAY DURING THE PERIOD 1960 - 1969[a]

Scientific name	Common name	Frequency occurrence Gizzard (246)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (.)	Aggregate percent[b] Gizzard (246)	Aggregate percent[b] Gullet (.)	Aggregate percent[b] Unknown (.)
Macoma balthica	Baltic macoma	26	.	.	19.6	.	.
Mya arenaria	soft-shelled clam	33	.	.	16.3	.	.
Congeria leucophaeta	Conrad's false mussel	8	.	.	2.7	.	.
Eurypanopeus depressus	mud crab	5	.	.	1.7	.	.
Rhithropaneopeus harrisi	white-fingered mud crab	9	.	.	1.5	.	.
Balanus spp.	barnacle	5	.	.	1.2	.	.
Rangia cuneata	brackish water clam	3	.	.	1.1	.	.
Macoma mitchelli (M. phenax)	Mitchell's clam	2	.	.	0.9	.	.
Brachiodontes recurvus (Mytilus)	hooked mussel	3	.	.	0.6	.	.
	undetermined fish	3	.	.	0.5	.	.
Gastropoda	snail, limpet	9	.	.	0.3	.	.
Mulinia lateralis	duck clam	2	.	.	0.3	.	.
Cyathura polita	isopod	1	.	.	0.3	.	.
Amygdulum papyria (Volsella)	paper mussel	1	.	.	0.2	.	.
Gemma gemma	gem clam	2	.	.	0.2	.	.
Hydrozoa	hydroid	1	.	.	0.1	.	.
Retusa canaliculata (Acteocina)	channeled barrel bubble	2	.	.	0.1	.	.
Amphipoda	scud, sideswimmer	1	.	.	0.1	.	.
Hydrobiidae		2	.	.	0.1	.	.
Pelecypoda (Bivalvia)	bivalve	0	.	.	0.0	.	.
Odonata	dragonfly, damselfly	1	.	.	0.0	.	.
Sayella chesapeakea	snail	1	.	.	0.0	.	.
Triphora nigrocincta (Triforis)	black triphora	1	.	.	0.0	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	1	.	.	0.0	.	.
Crustacea	crustacean	0	.	.	0.0	.	.
Microciona prolifera	red sponge	1	.	.	0.0	.	.
Pogonias cromis	black drum	1	.	.	0.0	.	.
	Total animal material	.	.	.	47.8	.	.
Zea mays	corn	33	.	.	18.4	.	.
Potamogeton perfoliatus	redhead grass	42	.	.	14.3	.	.
Ruppia maritima	widgeongrass	34	.	.	7.4	.	.
Myriophyllum spicatum	Eurasian watermilfoil	16	.	.	3.3	.	.
Ulva lactuca	sea lettuce	4	.	.	1.8	.	.
Najas guadalupensis	southern naiad	5	.	.	1.7	.	.
Triticum aestivum	wheat	2	.	.	1.5	.	.
Chlorophyceae	green algae	1	.	.	0.6	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	4	.	.	0.5	.	.
Spartina cynosuroides	big cordgrass	2	.	.	0.4	.	.
Rhus radicans	poison ivy - poison oak	0	.	.	0.4	.	.
Myrica cerifera	wax-myrtle	2	.	.	0.3	.	.
Vitis spp.	grape, wild grape	3	.	.	0.2	.	.

(continued)

APPENDIX TABLE C-4. (continued)[a]

		Frequency occurrence			Aggregate percent[b]		
Scientific name	Common name	Gizzard (246)	Gullet (.)	Unknown (.)	Gizzard (246)	Gullet (.)	Unknown (.)
Potamogeton pectinatus	sago pondweed	1	.	.	0.2	.	.
Cladium mariscoides	twig-rush	2	.	.	0.2	.	.
Smilax spp.	lily	0	.	.	0.2	.	.
Spartina alterniflora (stricta)	saltmarsh cordgrass	1	.	.	0.1	.	.
Iva frutescens	marsh-elder	0	.	.	0.1	.	.
Nyssa biflora	water gum	1	.	.	0.1	.	.
Myrica pensylvanica	bayberry	1	.	.	0.1	.	.
Prunus serotina	wild cherry (black cherry)	1	.	.	0.1	.	.
Polygonum punctatum	dotted smartweed	0	.	.	0.1	.	.
Enteromorpha spp.	filamentous green algae	1	.	.	0.0	.	.
Sparganium americanum	eastern burreed	1	.	.	0.0	.	.
Sparganium eurycarpum	big burreed	0	.	.	0.0	.	.
Scirpus validus	softstem bulrush	1	.	.	0.0	.	.
Liquidambar styraciflua	sweet gum (red gum)	1	.	.	0.0	.	.
Zostera marina	eelgrass	0	.	.	0.0	.	.
Scirpus americanus	common threesquare	1	.	.	0.0	.	.
Scirpus robustus	saltmarsh bulrush	1	.	.	0.0	.	.
Echinochloa Walteri		1	.	.	0.0	.	.
Polygonum pensylvanicum	smartweed	1	.	.	0.0	.	.
Polygonum Persicaria	smartweed	0	.	.	0.0	.	.
Rubus spp.	bramble	1	.	.	0.0	.	.
Cuscuta spp.	dodder	1	.	.	0.0	.	.
Ipomoea hederacea	morning glory	0	.	.	0.0	.	.
	Total plant material	.	.	.	52.3	.	.

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[a] Unpublished data from Rawls (in prep.).

[b] As defined by Swanson et al. (1974).

APPENDIX TABLE C-5. FOOD ITEMS OF GREATER SCAUP IN CHESAPEAKE BAY DURING THE PERIOD 1960 - 1969[a]

Scientific name	Common name	Frequency occurrence			Aggregate percent[b]		
		Gizzard (9)	Gullet (.)	Unknown (.)	Gizzard (9)	Gullet (.)	Unknown (.)
Brachiodontes recurvus (Mytilus)	hooked mussel	56	.	.	48.3	.	.
Pelecypoda (Bivalvia)	bivalve	33	.	.	6.7	.	.
Congeria leucophaeta	Conrad's false mussel	33	.	.	2.2	.	.
Mulinia lateralis	duck clam	22	.	.	2.2	.	.
Littorina irrorata	marsh periwinkle	11	.	.	1.1	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	22	.	.	1.1	.	.
Rhithropaneopeus harrisi	white-fingered mud crab	11	.	.	1.1	.	.
Hydrobiidae		22	.	.	0.0	.	.
Eurypanopeus depressus	mud crab	11	.	.	0.0	.	.
	Total animal material	.	.	.	62.8	.	.
Potamogeton perfoliatus	redhead grass	33	.	.	10.0	.	.
Potamogeton pusillus	slender pondweed	11	.	.	9.4	.	.
Ruppia maritima	widgeongrass	33	.	.	4.4	.	.
Hordeum vulgare	barley	11	.	.	4.4	.	.
Scirpus americanus	common threesquare	11	.	.	3.9	.	.
Zea mays	corn	11	.	.	1.1	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	11	.	.	1.1	.	.
Cladium mariscoides	twig-rush	11	.	.	0.6	.	.
Spartina cynosuroides	big cordgrass	11	.	.	0.6	.	.
Myriophyllum spicatum	Eurasian watermilfoil	11	.	.	0.6	.	.
Cornus Amomum	dogwood	11	.	.	0.6	.	.
	undetermined vegetation	11	.	.	0.6	.	.
	Total plant material	.	.	.	37.2	.	.

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[a] Unpublished data from Rawls (in prep.).

[b] As defined by Swanson et al. (1974).

APPENDIX TABLE C-6. FOOD ITEMS OF LESSER SCAUP IN CHESAPEAKE BAY DURING THE PERIOD 1960 - 1969[a]

		Frequency occurrence			Aggregate percent[b]		
Scientific name	Common name	Gizzard (82)	Gullet (.)	Unknown (.)	Gizzard (82)	Gullet (.)	Unknown (.)
Mya arenaria	soft-shelled clam	28	.	.	12.3	.	.
Brachiodontes recurvus (Mytilus)	hooked mussel	24	.	.	6.9	.	.
Balanus spp.	barnacle	18	.	.	5.2	.	.
Congeria leucophaeta	Conrad's false mussel	18	.	.	5.0	.	.
Odostomia impressa	incised odostome	27	.	.	3.5	.	.
Macoma balthica	Baltic macoma	6	.	.	2.7	.	.
Rhithropaneopeus harrisi	white-fingered mud crab	6	.	.	2.4	.	.
Mulinia lateralis	duck clam	10	.	.	2.2	.	.
Hydrobiidae		15	.	.	1.8	.	.
Gemma gemma	gem clam	4	.	.	1.6	.	.
	undetermined fish	1	.	.	0.7	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	7	.	.	0.7	.	.
Amygdulum papyria (Volsella)	paper mussel	5	.	.	0.5	.	.
Amphipoda	scud, sideswimmer	2	.	.	0.5	.	.
Gastropoda	snail, limpet	1	.	.	0.4	.	.
Isopoda	isopod	1	.	.	0.4	.	.
Epitonium rupicola	lined wentletrap	4	.	.	0.2	.	.
Pyramidellidae (Turbinellidae)	pyramid shell	1	.	.	0.1	.	.
Crustacea	crustacean	1	.	.	0.1	.	.
Palaemonetes spp.	grass shrimp	1	.	.	0.1	.	.
Retusa canaliculata (Acteocina)	channeled barrel bubble	1	.	.	0.1	.	.
Cyathura polita	isopod	1	.	.	0.1	.	.
Odonata	dragonfly, damselfly	1	.	.	0.1	.	.
Araneae	spider	1	.	.	0.1	.	.
Melampus bidentatus	salt marsh snail	1	.	.	0.0	.	.
Laevicardium mortoni	Morton's cockle	1	.	.	0.0	.	.
	Total animal material	.	.	.	47.6	.	.
Ruppia maritima	widgeongrass	66	.	.	20.5	.	.
Zea mays	corn	29	.	.	11.6	.	.
Potamogeton perfoliatus	redhead grass	46	.	.	10.8	.	.
Najas guadalupensis	southern naiad	5	.	.	2.6	.	.
Myriophyllum spicatum	Eurasian watermilfoil	7	.	.	2.1	.	.
Scirpus validus	softstem bulrush	9	.	.	1.3	.	.
Iva frutescens	marsh-elder	4	.	.	1.2	.	.
Ulva lactuca	sea lettuce	5	.	.	1.0	.	.
Potamogeton pectinatus	sago pondweed	7	.	.	0.9	.	.
Polygonum pensylvanicum	smartweed	4	.	.	0.7	.	.
Scirpus americanus	common threesquare	4	.	.	0.5	.	.
Nyssa biflora	water gum	5	.	.	0.4	.	.
Eleocharis obtusa	blunt spikerush	1	.	.	0.4	.	.
Heteranthera dubia	water star-grass	1	.	.	0.4	.	.

(continued)

APPENDIX TABLE C-6. (continued)[a]

Scientific name	Common name	Frequency occurrence			Aggregate percent[b]		
		Gizzard (82)	Gullet (.)	Unknown (.)	Gizzard (82)	Gullet (.)	Unknown (.)
Digitaria filiformis	crab grass	1	.	.	0.3	.	.
Sparganium americanum	eastern burreed	1	.	.	0.2	.	.
Potamogeton pusillus	slender pondweed	2	.	.	0.2	.	.
Rhus radicans	poison ivy - poison oak	2	.	.	0.2	.	.
Cuscuta spp.	dodder	2	.	.	0.2	.	.
Scirpus Olneyi	olney threesquare	1	.	.	0.1	.	.
Myrica pensylvanica	bayberry	2	.	.	0.1	.	.
Liquidambar styraciflua	sweet gum (red gum)	2	.	.	0.1	.	.
Prunus serotina	wild cherry (black cherry)	1	.	.	0.1	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	1	.	.	0.1	.	.
Cladium jamaicense	sawgrass	1	.	.	0.1	.	.
Hordeum vulgare	barley	1	.	.	0.1	.	.
Leersia oryzoides	cut grass	1	.	.	0.1	.	.
Smilax spp.	lily	1	.	.	0.1	.	.
Myrica cerifera	wax-myrtle	2	.	.	0.1	.	.
Rubus spp.	bramble	2	.	.	0.1	.	.
Rhus glabra	smooth sumac	1	.	.	0.1	.	.
Ilex opaca	American holly	1	.	.	0.1	.	.
Cornus Amomum	dogwood	1	.	.	0.1	.	.
Cornus florida	flowering dogwood	1	.	.	0.1	.	.
Gracilaria spp.	red weed	2	.	.	0.0	.	.
Chlorophyceae	green algae	1	.	.	0.0	.	.
Spartina alterniflora (stricta)	saltmarsh cordgrass	1	.	.	0.0	.	.
	Total plant material	.	.	.	56.7	.	.

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[a] Unpublished data from Rawls (in prep.).

[b] As defined by Swanson et al. (1974).

APPENDIX TABLE C-7. FOOD ITEMS OF RING-NECKED DUCKS IN CHESAPEAKE BAY DURING THE PERIOD 1960 - 1969[a]

Scientific name	Common name	Frequency occurrence Gizzard (10)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (.)	Aggregate percent[b] Gizzard (10)	Aggregate percent[b] Gullet (.)	Aggregate percent[b] Unknown (.)
Brachiodontes recurvus (Mytilus)	hooked mussel	10	.	.	3.0	.	.
Mya arenaria	soft-shelled clam	10	.	.	3.0	.	.
Odostomia impressa	incised odostome	10	.	.	0.0	.	.
	Total animal material	.	.	.	6.0	.	.
Potamogeton perfoliatus	redhead grass	60	.	.	37.0	.	.
Ruppia maritima	widgeongrass	40	.	.	12.0	.	.
Prunus serotina	wild cherry (black cherry)	10	.	.	10.0	.	.
Zea mays	corn	30	.	.	8.0	.	.
Quercus spp.	oak	10	.	.	8.0	.	.
Cladium mariscoides	twig-rush	10	.	.	5.5	.	.
Ulva lactuca	sea lettuce	10	.	.	5.0	.	.
Myriophyllum spicatum	Eurasian watermilfoil	10	.	.	3.0	.	.
Scirpus validus	softstem bulrush	10	.	.	1.5	.	.
Potamogeton pectinatus	sago pondweed	10	.	.	1.0	.	.
Sparganium americanum	eastern burreed	10	.	.	1.0	.	.
Cornus florida	flowering dogwood	10	.	.	1.0	.	.
Ipomoea hederacea	morning glory	10	.	.	1.0	.	.
Cladium jamaicense	sawgrass	10	.	.	0.0	.	.
Myrica pensylvanica	bayberry	10	.	.	0.0	.	.
Polygonum punctatum	dotted smartweed	10	.	.	0.0	.	.
	Total plant material	.	.	.	94.0	.	.

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[a] Unpublished data from Rawls (in prep.).

[b] As defined by Swanson et al. (1974).

APPENDIX TABLE C-8. FOOD ITEMS OF REDHEADS IN CHESAPEAKE BAY DURING THE PERIOD 1960 - 1969[a]

Scientific name	Common name	Frequency occurrence			Aggregate percent[b]		
		Gizzard (77)	Gullet (.)	Unknown (.)	Gizzard (77)	Gullet (.)	Unknown (.)
Congeria leucophaeta	Conrad's false mussel	5	.	.	6.7	.	.
Mya arenaria	soft-shelled clam	4	.	.	4.5	.	.
Macoma balthica	Baltic macoma	6	.	.	3.1	.	.
Macoma mitchelli (M. phenax)	Mitchell's clam	4	.	.	2.8	.	.
Rangia cuneata	brackish water clam	3	.	.	1.3	.	.
Balanus spp.	barnacle	8	.	.	1.3	.	.
Pelecypoda (Bivalvia)	bivalve	1	.	.	1.0	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	4	.	.	0.8	.	.
Brachiodontes recurvus (Mytilus)	hooked mussel	5	.	.	0.7	.	.
Odostomia impressa	incised odostome	5	.	.	0.6	.	.
Rhithropaneopeus harrisi	white-fingered mud crab	4	.	.	0.4	.	.
Epitonium rupicola	lined wentletrap	1	.	.	0.0	.	.
Formicidae	ant	1	.	.	0.0	.	.
Microciona prolifera	red sponge	1	.	.	0.0	.	.
	Total animal material	.	.	.	23.4	.	.
Zea mays	corn	36	.	.	29.3	.	.
Potamogeton perfoliatus	redhead grass	39	.	.	15.2	.	.
Ruppia maritima	widgeongrass	35	.	.	14.7	.	.
Myriophyllum spicatum	Eurasian watermilfoil	13	.	.	4.9	.	.
Triticum aestivum	wheat	6	.	.	4.6	.	.
Najas guadalupensis	southern naiad	6	.	.	4.0	.	.
Scirpus validus	softstem bulrush	3	.	.	1.3	.	.
Ulva lactuca	sea lettuce	4	.	.	1.1	.	.
Enteromorpha spp.	filamentous green algae	3	.	.	0.4	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	1	.	.	0.3	.	.
Potamogeton amplifolius	bigleaf pondweed	1	.	.	0.3	.	.
Cladium mariscoides	twig-rush	1	.	.	0.1	.	.
Prunus serotina	wild cherry (black cherry)	1	.	.	0.1	.	.
Hordeum vulgare	barley	1	.	.	0.1	.	.
Polygonum punctatum	dotted smartweed	4	.	.	0.1	.	.
Potamogeton pectinatus	sago pondweed	3	.	.	0.0	.	.
Cladium jamaicense	sawgrass	1	.	.	0.0	.	.
Polygonum pensylvanicum	smartweed	1	.	.	0.0	.	.
Rhus glabra	smooth sumac	1	.	.	0.0	.	.
Iva frutescens	marsh-elder	3	.	.	0.0	.	.
	Total plant material	.	.	.	76.6	.	.

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[a] Unpublished data from Rawls (in prep.).

[b] As defined by Swanson et al. (1974).

APPENDIX TABLE C-9. FOOD ITEMS OF AMERICAN WIGEON IN CHESAPEAKE BAY DURING THE PERIOD 1960 - 1969[a]

Scientific name	Common name	Frequency occurrence			Aggregate percent[b]		
		Gizzard (121)	Gullet (.)	Unknown (.)	Gizzard (121)	Gullet (.)	Unknown (.)
Macoma balthica	Baltic macoma	3	.	.	1.0	.	.
Amphipoda	scud, sideswimmer	3	.	.	0.8	.	.
Mya arenaria	soft-shelled clam	1	.	.	0.2	.	.
Rhithropaneopeus harrisi	white-fingered mud crab	2	.	.	0.2	.	.
Gastropoda	snail, limpet	2	.	.	0.0	.	.
	Total animal material	.	.	.	2.2	.	.
Ruppia maritima	widgeongrass	53	.	.	31.1	.	.
Potamogeton perfoliatus	redhead grass	40	.	.	23.6	.	.
Myriophyllum spicatum	Eurasian watermilfoil	40	.	.	23.5	.	.
Najas guadalupensis	southern naiad	10	.	.	5.8	.	.
Ulva lactuca	sea lettuce	9	.	.	4.5	.	.
Zea mays	corn	7	.	.	3.5	.	.
Iva frutescens	marsh-elder	4	.	.	3.2	.	.
Chlorophyceae	green algae	2	.	.	1.8	.	.
Zostera marina	eelgrass	2	.	.	0.6	.	.
Potamogeton pectinatus	sago pondweed	2	.	.	0.0	.	.
Polygonum pensylvanicum	smartweed	1	.	.	0.0	.	.
Rhus radicans	poison ivy - poison oak	1	.	.	0.0	.	.
Zizania aquatica	wildrice	1	.	.	0.0	.	.
Rubus spp.	bramble	1	.	.	0.0	.	.
Rhus Copallinum	sumac	1	.	.	0.0	.	.
	Total plant material	.	.	.	97.7	.	.

[a] Unpublished data from Rawls (in prep.).

[b] As defined by Swanson et al. (1974).

APPENDIX TABLE C-10. FOOD ITEMS OF GREEN-WINGED TEAL IN CHESAPEAKE BAY DURING THE PERIOD 1960 - 1969[a]

Scientific name	Common name	Frequency occurrence Gizzard (13)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (.)	Aggregate percent[b] Gizzard (13)	Aggregate percent[b] Gullet (.)	Aggregate percent[b] Unknown (.)
Acnida cannabinus (amaranthus)	tidemarsh waterhemp	85	.	.	51.9	.	.
Polygonum Persicaria	smartweed	54	.	.	12.7	.	.
Iva frutescens	marsh-elder	31	.	.	12.7	.	.
Scirpus robustus	saltmarsh bulrush	23	.	.	4.2	.	.
Zea mays	corn	8	.	.	4.2	.	.
Polygonum pensylvanicum	smartweed	15	.	.	4.2	.	.
Echinochloa Walteri		23	.	.	3.1	.	.
Scirpus validus	softstem bulrush	31	.	.	2.3	.	.
Scirpus americanus	common threesquare	38	.	.	1.9	.	.
Eleocharis obtusa	blunt spikerush	8	.	.	0.8	.	.
Scirpus Olneyi	olney threesquare	15	.	.	0.8	.	.
Polygonum punctatum	dotted smartweed	15	.	.	0.8	.	.
Echinochloa crusgalli	barnyard grass	8	.	.	0.4	.	.
Myriophyllum spicatum	Eurasian watermilfoil	8	.	.	0.0	.	.
	Total plant material	.	.	.	100.0	.	.

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[a] Unpublished data from Rawls (in prep.).

[b] As defined by Swanson et al. (1974).

APPENDIX TABLE C-11. FOOD ITEMS OF BLACK DUCKS IN CHESAPEAKE BAY DURING THE PERIOD 1960 - 1969[a]

Scientific name	Common name	Frequency occurrence			Aggregate percent[b]		
		Gizzard (131)	Gullet (.)	Unknown (.)	Gizzard (131)	Gullet (.)	Unknown (.)
Congeria leucophaeta	Conrad's false mussel	3	.	.	1.9	.	.
Gammaridae	scud	5	.	.	1.8	.	.
Mya arenaria	soft-shelled clam	3	.	.	0.9	.	.
Macoma balthica	Baltic macoma	1	.	.	0.6	.	.
Pelecypoda (Bivalvia)	bivalve	1	.	.	0.3	.	.
Cyathura polita	isopod	3	.	.	0.3	.	.
Balanus spp.	barnacle	2	.	.	0.2	.	.
	undetermined fish	1	.	.	0.1	.	.
Brachiodontes recurvus (Mytilus)	hooked mussel	1	.	.	0.1	.	.
Lepidoptera	butterfly, moth	1	.	.	0.1	.	.
Hydrobiidae		1	.	.	0.0	.	.
Epitonium rupicola	lined wentletrap	1	.	.	0.0	.	.
Mulinia lateralis	duck clam	1	.	.	0.0	.	.
Coleoptera	beetle	2	.	.	0.0	.	.
Melampus bidentatus	salt marsh snail	1	.	.	0.0	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	2	.	.	0.0	.	.
Insecta	insect	1	.	.	0.0	.	.
Odonata	dragonfly, damselfly	1	.	.	0.0	.	.
Pectinatella magnifica	bryozoan	1	.	.	0.0	.	.
	Total animal material	.	.	.	6.4	.	.
Zea mays	corn	27	.	.	17.5	.	.
Potamogeton perfoliatus	redhead grass	44	.	.	15.5	.	.
Ruppia maritima	widgeongrass	40	.	.	14.2	.	.
Myriophyllum spicatum	Eurasian watermilfoil	13	.	.	8.4	.	.
Ulva lactuca	sea lettuce	9	.	.	5.8	.	.
Najas guadalupensis	southern naiad	6	.	.	3.8	.	.
Polygonum pensylvanicum	smartweed	12	.	.	2.8	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	7	.	.	2.7	.	.
Polygonum punctatum	dotted smartweed	6	.	.	2.6	.	.
Sparganium americanum	eastern burreed	11	.	.	2.2	.	.
Iva frutescens	marsh-elder	4	.	.	2.0	.	.
Polygonum Persicaria	smartweed	14	.	.	1.8	.	.
Avena sativa	oats	2	.	.	1.4	.	.
Cyperus esculentus	galingale	4	.	.	1.3	.	.
Cladium mariscoides	twig-rush	3	.	.	1.0	.	.
Gramineae	grasses	3	.	.	0.9	.	.
Echinochloa crusgalli	barnyard grass	5	.	.	0.8	.	.
Distichlis spicata	salt grass	2	.	.	0.8	.	.
Polygonum densiflorum	southern smartweed	2	.	.	0.8	.	.
Smilax spp.	lily	5	.	.	0.7	.	.
Amaranthus hybridus	prince's feather	1	.	.	0.7	.	.

(continued)

APPENDIX TABLE C-11. (continued)[a]

Scientific name	Common name	Frequency occurrence			Aggregate percent[b]		
		Gizzard (131)	Gullet (.)	Unknown (.)	Gizzard (131)	Gullet (.)	Unknown (.)
Acnida cannabinus (amaranthus)	tidemarsh waterhemp	1	.	.	0.6	.	.
Polygonum arifolium	halberdleaf tear-thumb	2	.	.	0.4	.	.
Scirpus validus	softstem bulrush	5	.	.	0.4	.	.
Pinus Taeda	loblolly pine	1	.	.	0.3	.	.
Scirpus americanus	common threesquare	3	.	.	0.3	.	.
Myrica cerifera	wax-myrtle	4	.	.	0.3	.	.
Potamogeton amplifolius	bigleaf pondweed	11	.	.	0.2	.	.
Rhus Copallinum	sumac	3	.	.	0.2	.	.
Ilex laevigata	winterberry	1	.	.	0.2	.	.
Chlorophyceae	green algae	1	.	.	0.2	.	.
Panicum dichotomiflorum	panic grass	3	.	.	0.2	.	.
Spartina cynosuroides	big cordgrass	1	.	.	0.2	.	.
Prunus serotina	wild cherry (black cherry)	2	.	.	0.2	.	.
Ambrosia artemisiifolia	ragweed	2	.	.	0.2	.	.
Decodon verticillatus	water-willow	1	.	.	0.1	.	.
Potamogeton pusillus	slender pondweed	3	.	.	0.1	.	.
Zannichellia palustris	horned pondweed	2	.	.	0.1	.	.
Vallisneria americana (spiralis)	wildcelery	2	.	.	0.1	.	.
Sparganium eurycarpum	big burreed	1	.	.	0.1	.	.
Potamogeton pectinatus	sago pondweed	3	.	.	0.1	.	.
Eleocharis quadrangulata	squarestem spikerush	2	.	.	0.1	.	.
Myrica pensylvanica	bayberry	2	.	.	0.1	.	.
Rhus radicans	poison ivy - poison oak	2	.	.	0.1	.	.
Potamogeton nodosus (americanus)	longleaf pondweed	2	.	.	0.1	.	.
Digitaria sanguinalis	crab grass	3	.	.	0.1	.	.
Paspalum laeve	grass	1	.	.	0.1	.	.
Vitis vulpina (cordifolia)	forest-grape	2	.	.	0.1	.	.
Ipomoea hederacea	morning glory	1	.	.	0.1	.	.
	undetermined vegetation	2	.	.	0.1	.	.
Scirpus Olneyi	olney threesquare	1	.	.	0.0	.	.
Digitaria filiformis	crab grass	3	.	.	0.0	.	.
Phytolacca americana	pokeweed	2	.	.	0.0	.	.
Liquidambar styraciflua	sweet gum (red gum)	1	.	.	0.0	.	.
Rubus spp.	bramble	2	.	.	0.0	.	.
Rhus Toxicodendron	poison-oak	1	.	.	0.0	.	.
Ilex opaca	American holly	1	.	.	0.0	.	.
Berchemia scandens	supple-jack	1	.	.	0.0	.	.
Eleocharis obtusa	blunt spikerush	1	.	.	0.0	.	.
Scirpus robustus	saltmarsh bulrush	2	.	.	0.0	.	.
Eleusine indica	yard grass	1	.	.	0.0	.	.
Echinochloa colonum	jungle rice	1	.	.	0.0	.	.
Setaria Faberii	foxtail grass	1	.	.	0.0	.	.
Cuscuta spp.	dodder	2	.	.	0.0	.	.

(continued)

APPENDIX TABLE C-11. (continued)[a]

Scientific name	Common name	Frequency occurrence			Aggregate percent[b]		
		Gizzard (131)	Gullet (.)	Unknown (.)	Gizzard (131)	Gullet (.)	Unknown (.)
Nyssa aquatica	sour gum	1	.	.	0.0	.	.
Solanum carolinense	horse-nettle	1	.	.	0.0	.	.
Sambucus canadensis	common-elder	1	.	.	0.0	.	.
Nymphaea odorata (Castalia)	white water lily	1	.	.	0.0	.	.
	Total plant material	.	.	.	93.5	.	.

[a] Unpublished data from Rawls (in prep.).

[b] As defined by Swanson et al. (1974).

APPENDIX TABLE C-12. FOOD ITEMS OF MALLARDS IN CHESAPEAKE BAY DURING THE PERIOD 1960 - 1969[a]

		Frequency occurrence			Aggregate percent[b]		
Scientific name	Common name	Gizzard (134)	Gullet (.)	Unknown (.)	Gizzard (134)	Gullet (.)	Unknown (.)
Congeria leucophaeta	Conrad's false mussel	3	.	.	1.6	.	.
Mya arenaria	soft-shelled clam	4	.	.	1.3	.	.
Libelluidae	common skimmer	1	.	.	0.6	.	.
Balanus spp.	barnacle	2	.	.	0.4	.	.
Brachiodontes recurvus (Mytilus)	hooked mussel	1	.	.	0.2	.	.
Lyrogyrus spp.	snail	1	.	.	0.1	.	.
Rangia cuneata	brackish water clam	1	.	.	0.1	.	.
Macoma balthica	Baltic macoma	1	.	.	0.1	.	.
Amphipoda	scud, sideswimmer	1	.	.	0.1	.	.
Insecta	insect	1	.	.	0.1	.	.
Corixidae	water boatman	1	.	.	0.1	.	.
Lepidoptera	butterfly, moth	1	.	.	0.1	.	.
Macoma mitchelli (M. phenax)	Mitchell's clam	1	.	.	0.1	.	.
Odonata	dragonfly, damselfly	1	.	.	0.0	.	.
Epitonium rupicola	lined wentletrap	1	.	.	0.0	.	.
	Total animal material	.	.	.	4.9	.	.
Zea mays	corn	40	.	.	24.1	.	.
Potamogeton perfoliatus	redhead grass	23	.	.	10.4	.	.
Ruppia maritima	widgeongrass	23	.	.	8.2	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	10	.	.	4.4	.	.
Gramineae	grasses	7	.	.	4.0	.	.
Myriophyllum spicatum	Eurasian watermilfoil	10	.	.	3.6	.	.
Najas guadalupensis	southern naiad	4	.	.	3.3	.	.
Polygonum punctatum	dotted smartweed	13	.	.	2.6	.	.
Prunus serotina	wild cherry (black cherry)	7	.	.	2.2	.	.
Quercus spp.	oak	2	.	.	2.2	.	.
Scirpus americanus	common threesquare	15	.	.	2.1	.	.
Polygonum pensylvanicum	smartweed	15	.	.	1.8	.	.
Sparganium americanum	eastern burreed	12	.	.	1.8	.	.
Triticum aestivum	wheat	2	.	.	1.3	.	.
Panicum dichotomiflorum	panic grass	5	.	.	1.1	.	.
Potamogeton pusillus	slender pondweed	3	.	.	1.0	.	.
Chlorophyceae	green algae	8	.	.	1.0	.	.
Scirpus validus	softstem bulrush	11	.	.	1.0	.	.
Digitaria filiformis	crab grass	5	.	.	1.0	.	.
Polygonum arifolium	halberdleaf tear-thumb	3	.	.	1.0	.	.
Nyssa biflora	water gum	2	.	.	1.0	.	.
Myrica cerifera	wax-myrtle	6	.	.	0.9	.	.
Iva frutescens	marsh-elder	2	.	.	0.9	.	.
Cyperus strigosus	galingale	1	.	.	0.9	.	.
Spartina cynosuroides	big cordgrass	2	.	.	0.8	.	.

(continued)

APPENDIX TABLE C-12. (continued)[a]

Scientific name	Common name	Frequency occurrence Gizzard (134)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (.)	Aggregate percent[b] Gizzard (134)	Aggregate percent[b] Gullet (.)	Aggregate percent[b] Unknown (.)
Polygonum Persicaria	smartweed	6	.	.	0.8	.	.
Ulva lactuca	sea lettuce	1	.	.	0.8	.	.
Cladium mariscoides	twig-rush	2	.	.	0.8	.	.
Avena sativa	oats	1	.	.	0.8	.	.
Hordeum vulgare	barley	1	.	.	0.7	.	.
Cyperus esculentus	galingale	1	.	.	0.7	.	.
Ceratophyllum demersum	hornwort	1	.	.	0.7	.	.
Potamogeton foliosus	leafy pondweed	1	.	.	0.6	.	.
Setaria Faberii	foxtail grass	1	.	.	0.6	.	.
Ambrosia artemisiifolia	ragweed	6	.	.	0.5	.	.
Polygonum lapathifolium	nodding smartweed	6	.	.	0.5	.	.
Rhus Copallinum	sumac	3	.	.	0.4	.	.
Cynodon Dactylon	bermuda grass (wire grass)	1	.	.	0.4	.	.
Cornus Amomum	dogwood	1	.	.	0.4	.	.
Leersia oryzoides	cut grass	1	.	.	0.3	.	.
Vitis vulpina (cordifolia)	forest-grape	3	.	.	0.3	.	.
Echinochloa Walteri		1	.	.	0.3	.	.
Vitis aestivalis	summer-grape	1	.	.	0.3	.	.
Digitaria sanguinalis	crab grass	5	.	.	0.2	.	.
Eleocharis quadrangulata	squarestem spikerush	1	.	.	0.1	.	.
Cladium jamaicense	sawgrass	1	.	.	0.1	.	.
Myrica pensylvanica	bayberry	1	.	.	0.1	.	.
Phytolacca americana	pokeweed	3	.	.	0.1	.	.
Ilex opaca	American holly	1	.	.	0.1	.	.
Cuscuta spp.	dodder	1	.	.	0.1	.	.
Carya spp.	hickory	1	.	.	0.1	.	.
Eleocharis obtusa	blunt spikerush	2	.	.	0.1	.	.
Echinochloa crusgalli	barnyard grass	1	.	.	0.1	.	.
Cornus florida	flowering dogwood	1	.	.	0.1	.	.
Paspalum laeve	grass	2	.	.	0.1	.	.
Spartina patens	saltmeadow cordgrass	1	.	.	0.1	.	.
Polygonum Hydropiper	smartweed	1	.	.	0.1	.	.
Rhus glabra	smooth sumac	1	.	.	0.1	.	.
Ilex laevigata	winterberry	1	.	.	0.1	.	.
Cephalanthus occidentalis	buttonbush	3	.	.	0.1	.	.
	undetermined vegetation	1	.	.	0.1	.	.
Pontederia cordata	pickerel weed (tuckahoe)	1	.	.	0.0	.	.
Polygonum sagittatum	smartweed	1	.	.	0.0	.	.
Crotolaria spectabilis	rattlebox	1	.	.	0.0	.	.
Ampelopsis arborea	pepper-vine	1	.	.	0.0	.	.
Scirpus acutus (occidentalis)	hardstem bulrush	1	.	.	0.0	.	.
Scirpus robustus	saltmarsh bulrush	1	.	.	0.0	.	.
Distichlis spicata	salt grass	1	.	.	0.0	.	.

(continued)

APPENDIX TABLE C-12. (continued)[a]

		Frequency occurrence			Aggregate percent[b]		
Scientific name	Common name	Gizzard (134)	Gullet (.)	Unknown (.)	Gizzard (134)	Gullet (.)	Unknown (.)
Smilax spp.	lily	1	.	.	0.0	.	.
Rumex crispus	sour dock	1	.	.	0.0	.	.
Rubus spp.	bramble	1	.	.	0.0	.	.
Plantago lanceolata	English plantain	1	.	.	0.0	.	.
Nymphaea odorata (Castalia)	white water lily	1	.	.	0.0	.	.
	Total plant material	.	.	.	94.5	.	.

[a] Unpublished data from Rawls (in prep.).

[b] As defined by Swanson et al. (1974).

APPENDIX TABLE C-13. FOOD ITEMS OF PINTAILS IN CHESAPEAKE BAY DURING THE PERIOD 1960 - 1969[a]

		Frequency occurrence			Aggregate percent[b]		
Scientific name	Common name	Gizzard (47)	Gullet (.)	Unknown (.)	Gizzard (47)	Gullet (.)	Unknown (.)
Goniobasis spp.	snail	2	.	.	1.7	.	.
Palaemonetes spp.	grass shrimp	2	.	.	0.8	.	.
Macoma balthica	Baltic macoma	2	.	.	0.4	.	.
Physa spp.	snail	2	.	.	0.2	.	.
Polychaeta	polychaete	2	.	.	0.2	.	.
Coleoptera	beetle	2	.	.	0.2	.	.
Planorbidae	orb snail	2	.	.	0.0	.	.
Formicidae	ant	2	.	.	0.0	.	.
	Total animal material	.	.	.	3.6	.	.
Zea mays	corn	53	.	.	28.5	.	.
Polygonum pensylvanicum	smartweed	23	.	.	9.7	.	.
Pennisetum spp.	feathertop	11	.	.	9.5	.	.
Ruppia maritima	widgeongrass	17	.	.	6.1	.	.
Myriophyllum spicatum	Eurasian watermilfoil	23	.	.	5.6	.	.
Hordeum vulgare	barley	4	.	.	4.3	.	.
Panicum dichotomiflorum	panic grass	19	.	.	3.8	.	.
Eleocharis obtusa	blunt spikerush	13	.	.	3.0	.	.
Prunus serotina	wild cherry (black cherry)	4	.	.	2.4	.	.
Gramineae	grasses	4	.	.	2.1	.	.
Myrica cerifera	wax-myrtle	11	.	.	2.1	.	.
Myrica pensylvanica	bayberry	4	.	.	2.1	.	.
Polygonum lapathifolium	nodding smartweed	15	.	.	2.0	.	.
Scirpus validus	softstem bulrush	15	.	.	1.9	.	.
Echinochloa crusgalli	barnyard grass	15	.	.	1.8	.	.
Cyperus strigosus	galingale	6	.	.	1.5	.	.
Potamogeton perfoliatus	redhead grass	13	.	.	1.4	.	.
Digitaria sanguinalis	crab grass	23	.	.	1.4	.	.
Digitaria Ischaemum	crab grass	6	.	.	1.0	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	4	.	.	0.8	.	.
Enteromorpha spp.	filamentous green algae	2	.	.	0.6	.	.
Amaranthus hybridus	prince's feather	9	.	.	0.6	.	.
Digitaria filiformis	crab grass	11	.	.	0.5	.	.
Solanum carolinense	horse-nettle	2	.	.	0.5	.	.
Sparganium americanum	eastern burreed	6	.	.	0.4	.	.
Scirpus americanus	common threesquare	6	.	.	0.4	.	.
Echinochloa Walteri		2	.	.	0.4	.	.
Cladium jamaicense	sawgrass	4	.	.	0.3	.	.
Potamogeton pectinatus	sago pondweed	2	.	.	0.2	.	.
Leersia oryzoides	cut grass	2	.	.	0.2	.	.
Rhus Copallinum	sumac	2	.	.	0.2	.	.
Cyperus esculentus	galingale	2	.	.	0.1	.	.

(continued)

APPENDIX TABLE C-13. (continued)[a]

Scientific name	Common name	Frequency occurrence			Aggregate percent[b]		
		Gizzard (47)	Gullet (.)	Unknown (.)	Gizzard (47)	Gullet (.)	Unknown (.)
Scirpus Olneyi	olney threesquare	2	.	.	0.1	.	.
Setaria Faberii	foxtail grass	9	.	.	0.1	.	.
Rumex obtusifolius	bitter dock	2	.	.	0.1	.	.
Polygonum Persicaria	smartweed	4	.	.	0.1	.	.
Plantago lanceolata	English plantain	4	.	.	0.1	.	.
Ambrosia artemisiifolia	ragweed	2	.	.	0.1	.	.
Zannichellia palustris	horned pondweed	2	.	.	0.0	.	.
Eleocharis quadrangulata	squarestem spikerush	2	.	.	0.0	.	.
Cladium mariscoides	twig-rush	2	.	.	0.0	.	.
Lolium perenne	English rye grass	2	.	.	0.0	.	.
Paspalum laeve	grass	4	.	.	0.0	.	.
Setaria geniculata	foxtail grass	2	.	.	0.0	.	.
Amaranthus hybridus	prince's feather	6	.	.	0.0	.	.
Acnida cannabinus (amaranthus)	tidemarsh waterhemp	2	.	.	0.0	.	.
Polygonum densiflorum	southern smartweed	2	.	.	0.0	.	.
Phytolacca americana	pokeweed	6	.	.	0.0	.	.
Lespedeza striata	Japanese clover	2	.	.	0.0	.	.
Lespedeza bicolor	pulse	2	.	.	0.0	.	.
Vitis vulpina (cordifolia)	forest-grape	2	.	.	0.0	.	.
Cephalanthus occidentalis	buttonbush	2	.	.	0.0	.	.
	Total plant material	.	.	.	96.4	.	.

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[a] Unpublished data from Rawls (in prep.).

[b] As defined by Swanson et al. (1974).

APPENDIX TABLE D-1. FOOD ITEMS OF BUFFLEHEADS IN CHESAPEAKE BAY DURING THE PERIOD 1970 - 1979

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (30)	Gullet (2)	Unknown (.)	Gizzard (30)	Gullet (2)	Unknown (.)
Mulinia lateralis	duck clam	47	.	.	17.0	.	.
Mya arenaria	soft-shelled clam	30	.	.	10.9	.	.
Nereis spp.	clam worm	30	.	.	7.8	.	.
Macoma balthica	Baltic macoma	17	.	.	7.2	.	.
Leptocheirus plumulosus	amphipod	20	.	.	5.8	.	.
Rhithropaneopeus harrisi	white-fingered mud crab	33	.	.	4.0	.	.
Brachiodontes recurvus (Mytilus)	hooked mussel	17	.	.	3.6	.	.
Chironomidae	midge	3	.	.	3.3	.	.
Cyprinodon variegatus	sheepshead minnow	3	.	.	3.0	.	.
Lepomis gibbosus	bluegill	3	.	.	2.7	.	.
Corophium spp.	amphipod	7	.	.	2.2	.	.
Amnicoliidae (Bulimidae)	swamp snail	7	.	.	1.7	.	.
Fundulus spp.		3	.	.	1.3	.	.
Palaemonetes pugio	prawn	10	.	.	1.3	.	.
Anguilla rostrata	American eel	3	50	.	1.3	50.0	.
Cyathura polita	isopod	7	.	.	1.2	.	.
Scarabaeidae	scarab beetle	3	.	.	1.1	.	.
Anisoptera	dragonfly	3	.	.	1.1	.	.
Apeltes quadracus		3	.	.	0.9	.	.
Gemma gemma	gem clam	7	.	.	0.7	.	.
Gammaridae	scud	7	.	.	0.4	.	.
Electra crustulenta	lacy crust	7	.	.	0.3	.	.
Molgula manhattensis	sea grape	3	.	.	0.2	.	.
Balanus spp.	barnacle	3	.	.	0.2	.	.
Callinectus sapidus	blue crab	3	.	.	0.1	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	3	.	.	0.0	.	.
Cyathura carinata (polita)	isopod	3	.	.	0.0	.	.
Edotea triloba	isopod	7	.	.	0.0	.	.
	undetermind animal	3	.	.	0.0	.	.
Odostomia spp.	odostome	13	.	.	0.0	.	.
Odostomia impressa	incised odostome	3	.	.	0.0	.	.
Melampus bidentatus	salt marsh snail	3	.	.	0.0	.	.
Congeria leucophaeta	Conrad's false mussel	7	.	.	0.0	.	.
Edotea spp.		3	.	.	0.0	.	.
	Total animal material	93	50	.	79.2	50.0	.
Potamogeton pectinatus	sago pondweed	17	50	.	9.2	50.0	.
Zostera marina	eelgrass	7	.	.	3.8	.	.
Spartina alterniflora (stricta)	saltmarsh cordgrass	3	.	.	3.3	.	.
Ruppia maritima	widgeongrass	53	.	.	2.6	.	.
Cyperus strigosus	galingale	3	.	.	1.1	.	.
Potamogeton perfoliatus	redhead grass	27	.	.	0.4	.	.

(continued)

APPENDIX TABLE D-1. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (30)	Frequency occurrence Gullet (2)	Frequency occurrence Unknown (.)	Aggregate percent[a] Gizzard (30)	Aggregate percent[a] Gullet (2)	Aggregate percent[a] Unknown (.)
Zannichellia palustris	horned pondweed	13	.	.	0.2	.	.
Robinia Psuedoacacia	black locust	7	.	.	0.1	.	.
Rhus radicans	poison ivy - poison oak	3	.	.	0.0	.	.
Echinochloa Walteri		3	.	.	0.0	.	.
Panicum dichotomiflorum	panic grass	3	.	.	0.0	.	.
Paspalum ciliatifolium		3	.	.	0.0	.	.
Setaria glauca	foxtail grass	3	.	.	0.0	.	.
Zea mays	corn	3	.	.	0.0	.	.
Distichlis spicata	salt grass	3	.	.	0.0	.	.
Polygonum punctatum	dotted smartweed	3	.	.	0.0	.	.
Liquidambar styraciflua	sweet gum (red gum)	7	.	.	0.0	.	.
Prunus serotina	wild cherry (black cherry)	3	.	.	0.0	.	.
Vitaceae	grape	3	.	.	0.0	.	.
	undetermined vegetation	3	.	.	0.0	.	.
	Total plant material	80	50	.	20.8	50.0	.

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE D-2. FOOD ITEMS OF COMMON GOLDENEYES IN CHESAPEAKE BAY DURING THE PERIOD 1970 - 1979

Scientific name	Common name	Frequency occurrence Gizzard (21)	Frequency occurrence Gullet (1)	Frequency occurrence Unknown (2)	Aggregate percent[a] Gizzard (21)	Aggregate percent[a] Gullet (1)	Aggregate percent[a] Unknown (2)
Littorina irrorata	marsh periwinkle	.	.	50	.	.	0.0
Crustacea	crustacean	.	.	50	.	.	0.0
Gammarus palustris	scud	.	.	100	.	.	3.5
Trichoptera	caddisfly	.	.	50	.	.	1.0
	undetermined fish	.	.	50	.	.	0.0
Gobiosoma spp.	naked goby	.	.	100	.	.	5.0
Brevoortia tyrannus	Atlantic menhaden	.	.	50	.	.	25.0
Opsanus tau	oyster toadfish	.	.	50	.	.	2.5
Brachiodontes recurvus (Mytilus)	hooked mussel	33	.	100	12.1	.	2.5
Mulinia lateralis	duck clam	48	.	.	10.0	.	.
Rhithropaneopeus harrisi	white-fingered mud crab	52	.	100	8.6	.	18.0
Mya arenaria	soft-shelled clam	19	.	.	8.3	.	.
Macoma balthica	Baltic macoma	52	.	.	7.9	.	.
Palaemonetes pugio	prawn	29	.	100	6.4	.	41.5
Fundulus heteroclites		19	.	.	6.4	.	.
Rangia cuneata	brackish water clam	14	.	.	5.7	.	.
Balanus spp.	barnacle	24	.	50	2.8	.	1.0
Lepomis macrochirus	bluegill	10	.	.	2.7	.	.
Erichsonella attenuata	isopod	5	.	.	2.6	.	.
Bairdiella chrysura	silver perch	5	.	.	0.5	.	.
Apeltes quadracus		10	.	.	0.2	.	.
Macoma mitchelli (M. phenax)	Mitchell's clam	5	.	.	0.1	.	.
Gammarus mucronatus	scud	10	.	.	0.1	.	.
Amphipoda	scud, sideswimmer	5	.	.	0.1	.	.
Balanus eburneus	ivory barnacle	5	.	.	0.1	.	.
Gobiosoma bosci	goby	5	.	.	0.1	.	.
Zygoptera	damselfly	5	.	.	0.0	.	.
	undetermind animal	5	.	.	0.0	.	.
Gastropoda	snail, limpet	5	.	.	0.0	.	.
Odostomia spp.	odostome	14	.	.	0.0	.	.
Amnicoliidae (Bulimidae)	swamp snail	14	.	.	0.0	.	.
Congeria leucophaeta	Conrad's false mussel	5	.	.	0.0	.	.
Nereis spp.	clam worm	10	.	50	0.0	.	0.0
Gammarus spp.	scud	5	.	.	0.0	.	.
Corophium spp.	amphipod	5	.	.	0.0	.	.
Scarabaeidae	scarab beetle	5	.	.	0.0	.	.
Curculionidae	snout beetle	5	.	.	0.0	.	.
	Total animal material	100	0	100	74.9	.	100.0
Zea mays	corn	24	100	.	9.6	100.0	.
Potamogeton pectinatus	sago pondweed	19	.	.	5.8	.	.
Ruppia maritima	widgeongrass	52	.	.	4.4	.	.

(continued)

APPENDIX TABLE D-2. (continued)

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (21)	Gullet (1)	Unknown (2)	Gizzard (21)	Gullet (1)	Unknown (2)
Liquidambar styraciflua	sweet gum (red gum)	24	.	.	2.8	.	.
Panicum dichotomiflorum	panic grass	5	.	.	1.6	.	.
Potamogeton perfoliatus	redhead grass	29	.	.	0.5	.	.
Hordeum vulgare	barley	5	.	.	0.4	.	.
Pinus Taeda	loblolly pine	10	.	.	0.0	.	.
Rhodophyceae	red algae	5	.	.	0.0	.	.
Cyperus esculentus	galingale	5	.	.	0.0	.	.
Quercus spp.	oak	5	.	.	0.0	.	.
Polygonum densiflorum	southern smartweed	5	.	.	0.0	.	.
Phytolacca americana	pokeweed	5	.	.	0.0	.	.
Rubus spp.	bramble	5	.	.	0.0	.	.
Vitaceae	grape	5	.	.	0.0	.	.
Ambrosia artemisiifolia	ragweed	5	.	.	0.0	.	.
	Total plant material	81	100	0	25.1	100.0	.

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE D-3. FOOD ITEMS OF CANVASBACKS IN CHESAPEAKE BAY DURING THE PERIOD 1970 - 1979

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (273)	Gullet (68)	Unknown (45)	Gizzard (273)	Gullet (68)	Unknown (45)
Bittium varium	variable bittium	.	.	2	.	.	0.0
Odostomia trifida	tripartite odostome	.	.	2	.	.	0.0
Amnicoliidae (Bulimidae)	swamp snail	.	.	2	.	.	0.0
Pelecypoda (Bivalvia)	bivalve	.	.	4	.	.	0.0
Cyathura carinata (polita)	isopod	.	.	2	.	.	0.0
Gammarus spp.	scud	.	3	.	.	0.0	.
Molgula spp.	sea grape	.	.	4	.	.	2.2
Macoma balthica	Baltic macoma	93	76	49	84.1	69.1	41.3
Mya arenaria	soft-shelled clam	5	16	.	2.5	6.7	.
Rangia cuneata	brackish water clam	10	.	29	1.8	.	21.4
Leptocheirus plumulosus	amphipod	8	13	.	0.8	0.6	.
Nereis spp.	clam worm	10	3	18	0.6	0.1	0.8
Rhithropaneopeus harrisi	white-fingered mud crab	4	3	2	0.4	0.8	0.1
Macoma mitchelli (M. phenax)	Mitchell's clam	6	16	.	0.3	2.3	.
Balanus spp.	barnacle	2	1	.	0.2	0.0	.
	undetermind animal	1	.	.	0.2	.	.
Congeria leucophaeta	Conrad's false mussel	1	.	.	0.2	.	.
Cyathura polita	isopod	2	9	.	0.0	0.6	.
Nereis succinea	clam worm	0	3	.	0.0	0.6	.
Gammarus tigrinus	scud	1	4	.	0.0	0.0	.
Aoridae		1	1	.	0.0	0.0	.
Porifera	sponge	0	.	.	0.0	.	.
Odostomia spp.	odostome	1	.	.	0.0	.	.
Retusa canaliculata (Acteocina)	channeled barrel bubble	0	.	.	0.0	.	.
Brachiodontes recurvus (Mytilus)	hooked mussel	2	.	.	0.0	.	.
Bittium spp.		0	.	.	0.0	.	.
Gemma gemma	gem clam	0	.	.	0.0	.	.
Mulinia lateralis	duck clam	1	3	2	0.0	0.0	0.2
Polychaeta	polychaete	0	.	.	0.0	.	.
Gammaridae	scud	0	.	.	0.0	.	.
Xanthidae (Pilumnidae)	mud crab	0	.	.	0.0	.	.
Scarabaeidae	scarab beetle	0	.	.	0.0	.	.
Chalepus dorsalis		0	.	.	0.0	.	.
Vespa spp.		0	.	.	0.0	.	.
	Total animal material	99	84	93	91.4	81.0	66.2
Hordeum vulgare	barley	.	1	.	.	0.0	.
Spartina spp.	cordgrass	.	.	2	.	.	0.0
Triticum aestivum	wheat	.	1	7	.	0.0	4.2
Myrica spp.	wax-myrtle	.	.	2	.	.	0.0
Crataegus spp.	hawthorn	.	.	2	.	.	0.0
Ipomoea hederacea	morning glory	.	.	2	.	.	0.0

(continued)

APPENDIX TABLE D-3. (continued)

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (273)	Gullet (68)	Unknown (45)	Gizzard (273)	Gullet (68)	Unknown (45)
Zea mays	corn	7	12	42	4.1	9.7	22.4
Potamogeton perfoliatus	redhead grass	6	6	2	1.4	4.4	0.3
Sorgum vulgare	grass	1	6	.	1.2	4.1	.
Ruppia maritima	widgeongrass	9	3	27	0.6	0.0	6.7
Chlorophyceae	green algae	0	.	.	0.3	.	.
Vallisneria americana (spiralis)	wildcelery	1	1	2	0.3	0.7	0.1
Distichlis spicata	salt grass	1	.	.	0.2	.	.
Polygonum punctatum	dotted smartweed	1	.	.	0.1	.	.
Zostera marina	eelgrass	1	1	2	0.1	0.0	0.0
Cladium mariscoides	twig-rush	1	.	2	0.1	.	0.0
Scirpus spp.	bulrush	0	.	.	0.1	.	.
Polygonum arifolium	halberdleaf tear-thumb	0	.	.	0.1	.	.
Cuscuta spp.	dodder	0	.	.	0.1	.	.
Prunus serotina	wild cherry (black cherry)	0	.	2	0.0	.	0.0
Scirpus americanus	common threesquare	2	.	2	0.0	.	0.0
Cladophora spp.	green algae	0	.	.	0.0	.	.
Scirpus Olneyi	olney threesquare	1	.	2	0.0	.	0.0
Heteranthera dubia	water star-grass	0	.	.	0.0	.	.
Myrica cerifera	wax-myrtle	1	.	.	0.0	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	3	.	.	0.0	.	.
Ilex opaca	American holly	0	.	.	0.0	.	.
Pinus Taeda	loblolly pine	0	.	.	0.0	.	.
Potamogeton pectinatus	sago pondweed	1	.	7	0.0	.	0.0
Sparganium eurycarpum	big burreed	0	.	.	0.0	.	.
Scirpus robustus	saltmarsh bulrush	1	.	.	0.0	.	.
Scirpus validus	softstem bulrush	0	.	.	0.0	.	.
Carex lurida	sedge	0	.	.	0.0	.	.
Panicum dichotomiflorum	panic grass	0	.	.	0.0	.	.
Sorgum halapense	Johnson grass	0	.	.	0.0	.	.
Amaranthus spp.	amaranth	0	.	.	0.0	.	.
Geraniaceae	geranium	0	.	.	0.0	.	.
Rhus Copallinum	sumac	1	.	.	0.0	.	.
Ilex decidua	holly	0	.	.	0.0	.	.
Vitaceae	grape	0	.	2	0.0	.	0.0
Vitis spp.	grape, wild grape	0	.	.	0.0	.	.
Myriophyllum spicatum	Eurasian watermilfoil	0	.	.	0.0	.	.
Datura stramonium	jimson-weed	0	.	.	0.0	.	.
	Total plant material	23	21	56	8.6	19.0	33.8

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE D-4. FOOD ITEMS OF GREATER SCAUP IN CHESAPEAKE BAY DURING THE PERIOD 1970 - 1979[a]

Scientific name	Common name	Frequency occurrence Gizzard (40)	Frequency occurrence Gullet (8)	Frequency occurrence Unknown (.)	Aggregate percent[a] Gizzard (40)	Aggregate percent[a] Gullet (8)	Aggregate percent[a] Unknown (.)
Gammarus spp.	scud	.	13	.	.	0.1	.
Balanidae	rock barnacle	.	13	.	.	0.0	.
Brachiodontes recurvus (Mytilus)	hooked mussel	65	13	.	32.2	0.0	.
Rangia cuneata	brackish water clam	35	.	.	15.0	.	.
Balanus spp.	barnacle	35	.	.	6.7	.	.
Molgula manhattensis	sea grape	8	.	.	4.0	.	.
Macoma balthica	Baltic macoma	20	13	.	2.6	4.4	.
Mulinia lateralis	duck clam	13	.	.	2.5	.	.
Mya arenaria	soft-shelled clam	15	.	.	2.3	.	.
Urosalpinx cinerea	Atlantic oyster drill	3	.	.	0.5	.	.
Nassarius vibex	mottled dog whelk	18	.	.	0.3	.	.
Neopanope texana sayi	mud crab	5	.	.	0.3	.	.
Congeria leucophaeta	Conrad's false mussel	8	.	.	0.2	.	.
Nassarius obsoletus (Nyanassa)	mud dog whelk	5	.	.	0.1	.	.
Littorina irrorata	marsh periwinkle	5	.	.	0.1	.	.
Cyathura polita	isopod	3	13	.	0.1	0.5	.
Rhithropaneopeus harrisi	white-fingered mud crab	3	13	.	0.1	3.8	.
Odostomia spp.	odostome	10	.	.	0.0	.	.
Gemma gemma	gem clam	5	.	.	0.0	.	.
Nereis succinea	clam worm	3	13	.	0.0	1.3	.
Retusa canaliculata (Acteocina)	channeled barrel bubble	10	.	.	0.0	.	.
Callinectus sapidus	blue crab	3	.	.	0.0	.	.
	undetermind animal	3	.	.	0.0	.	.
Bittium varium	variable bittium	3	.	.	0.0	.	.
Hydrobia spp. (Littoridinops)	swamp snail	3	.	.	0.0	.	.
Macoma mitchelli (M. phenax)	Mitchell's clam	5	.	.	0.0	.	.
Nereis spp.	clam worm	8	.	.	0.0	.	.
Gammarus mucronatus	scud	3	.	.	0.0	.	.
Balanus improvisus	bay barnacle	3	.	.	0.0	.	.
Myrmica spp.	ant	3	.	.	0.0	.	.
Odontomyia spp.		3	.	.	0.0	.	.
Electra crustulenta	lacy crust	3	.	.	0.0	.	.
	Total animal material	98	13	.	67.2	10.0	.
	undetermined vegetation	.	13	.	.	12.4	.
Zea mays	corn	28	63	.	16.9	62.5	.
Zostera marina	eelgrass	10	13	.	4.4	0.0	.
Avena sativa	oats	3	.	.	2.3	.	.
Cladophora spp.	green algae	3	.	.	2.1	.	.
Secale cereale	rye	3	.	.	2.0	.	.
Ruppia maritima	widgeongrass	25	13	.	1.6	0.1	.
Rubus spp.	bramble	3	.	.	1.3	.	.

(continued)

APPENDIX TABLE D-4. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (40)	Frequency occurrence Gullet (8)	Frequency occurrence Unknown (.)	Aggregate percent[a] Gizzard (40)	Aggregate percent[a] Gullet (8)	Aggregate percent[a] Unknown (.)
Ulva lactuca	sea lettuce	3	.	.	0.8	.	.
Enteromorpha intestinalis	green alga	3	13	.	0.4	2.5	.
Nyssa sylvatica (biflora)	black gum (sour gum)	5	.	.	0.3	.	.
Chlorophyceae	green algae	3	13	.	0.3	12.5	.
Bromus secalinus	cheat (chess)	3	.	.	0.1	.	.
Agrostemma Githago	corn-cockle	3	.	.	0.1	.	.
Rumex crispus	sour dock	3	.	.	0.1	.	.
Pinus Taeda	loblolly pine	3	.	.	0.0	.	.
Ranunculus acris	buttercup	3	.	.	0.0	.	.
Ilex opaca	American holly	5	.	.	0.0	.	.
Cornus florida	flowering dogwood	3	.	.	0.0	.	.
Ipomoea hederacea	morning glory	3	.	.	0.0	.	.
Scirpus americanus	common threesquare	3	.	.	0.0	.	.
Hordeum vulgare	barley	3	.	.	0.0	.	.
Distichlis spicata	salt grass	3	.	.	0.0	.	.
Triticum aestivum	wheat	3	.	.	0.0	.	.
Amaranthus spp.	amaranth	3	.	.	0.0	.	.
Rumex spp.	dock, sorrel	3	.	.	0.0	.	.
Liquidambar styraciflua	sweet gum (red gum)	3	.	.	0.0	.	.
Phaseolus vulgaris	common bean	3	.	.	0.0	.	.
Ambrosia artemisiifolia	ragweed	3	.	.	0.0	.	.
	Total plant material	55	100	.	32.8	90.0	.

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE D-5. FOOD ITEMS OF LESSER SCAUP IN CHESAPEAKE BAY DURING THE PERIOD 1970 - 1979

Scientific name	Common name	Frequency occurrence Gizzard (76)	Frequency occurrence Gullet (18)	Frequency occurrence Unknown (.)	Aggregate percent[a] Gizzard (76)	Aggregate percent[a] Gullet (18)	Aggregate percent[a] Unknown (.)
Rangia cuneata	brackish water clam	41	.	.	10.9	.	.
Brachiodontes recurvus (Mytilus)	hooked mussel	32	.	.	5.3	.	.
Balanus spp.	barnacle	41	.	.	5.0	.	.
Macoma balthica	Baltic macoma	22	.	.	2.9	.	.
Mulinia lateralis	duck clam	8	.	.	2.8	.	.
Mya arenaria	soft-shelled clam	7	.	.	2.2	.	.
Odostomia spp.	odostome	20	.	.	1.8	.	.
Rhithropaneopeus harrisi	white-fingered mud crab	18	6	.	1.5	0.3	.
Corophiidae	scud, sideswimmer	1	.	.	1.3	.	.
Congeria leucophaeta	Conrad's false mussel	8	.	.	1.2	.	.
Corophium spp.	amphipod	11	6	.	1.1	1.1	.
Urosalpinx cinerea	Atlantic oyster drill	1	.	.	1.1	.	.
Nereis spp.	clam worm	17	6	.	1.0	0.0	.
Molgula manhattensis	sea grape	3	.	.	0.7	.	.
Formicidae	ant	5	.	.	0.6	.	.
Retusa canaliculata (Acteocina)	channeled barrel bubble	12	.	.	0.5	.	.
Gammaridae	scud	1	.	.	0.4	.	.
Chironomidae	midge	1	.	.	0.4	.	.
Nassarius obsoletus (Nyanassa)	mud dog whelk	5	.	.	0.4	.	.
Gemma gemma	gem clam	5	.	.	0.3	.	.
Hydrobia spp. (Littoridinops)	swamp snail	3	.	.	0.2	.	.
Curculionidae	snout beetle	1	.	.	0.1	.	.
Coelenterata (Cnidaria)	hydroid, jellyfish	1	.	.	0.1	.	.
Fundulus heteroclites		1	.	.	0.1	.	.
Pyramidellidae (Turbinellidae)	pyramid shell	3	.	.	0.1	.	.
Nassarius vibex	mottled dog whelk	5	.	.	0.1	.	.
	undetermind animal	4	.	.	0.1	.	.
Melampus bidentatus	salt marsh snail	1	.	.	0.0	.	.
Pelecypoda (Bivalvia)	bivalve	3	.	.	0.0	.	.
Mitrella lunata	crescent mitrella	5	.	.	0.0	.	.
Bittium varium	variable bittium	1	.	.	0.0	.	.
Anachis avara	greedy dove shell	1	.	.	0.0	.	.
Pyramidella spp.	pyramid shell	1	.	.	0.0	.	.
Odostomia trifida	tripartite odostome	1	.	.	0.0	.	.
Nassarius trivittatus (Nassa)	New England dog whelk	1	.	.	0.0	.	.
Nassarius spp.	dog whelk	1	.	.	0.0	.	.
Amnicola spp.	amnicola	1	.	.	0.0	.	.
Littorinidae	periwinkle	1	.	.	0.0	.	.
Littorina irrorata	marsh periwinkle	4	.	.	0.0	.	.
Polistes spp.	paper wasp	1	.	.	0.0	.	.
	undetermined fish	1	.	.	0.0	.	.
	Total animal material	91	6	.	42.1	1.4	.

(continued)

APPENDIX TABLE D-5. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (76)	Frequency occurrence Gullet (18)	Frequency occurrence Unknown (.)	Aggregate percent[a] Gizzard (76)	Aggregate percent[a] Gullet (18)	Aggregate percent[a] Unknown (.)
Eleusine indica	yard grass	.	6	.	.	0.0	.
Chenopodium album	lamb's quarters	.	6	.	.	0.0	.
Zea mays	corn	55	94	.	41.9	93.1	.
Ruppia maritima	widgeongrass	22	.	.	2.6	.	.
Triticum aestivum	wheat	4	.	.	2.3	.	.
Cladophora spp.	green algae	4	.	.	2.1	.	.
Zostera marina	eelgrass	3	.	.	1.3	.	.
Ilex decidua	holly	3	.	.	0.9	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	13	.	.	0.8	.	.
	undetermined vegetation	5	.	.	0.6	.	.
Scirpus americanus	common threesquare	4	.	.	0.5	.	.
Polygonum densiflorum	southern smartweed	1	.	.	0.5	.	.
Cyperus spp.	galingale	1	.	.	0.4	.	.
Enteromorpha spp.	filamentous green algae	1	.	.	0.4	.	.
Sparganium americanum	eastern burreed	1	.	.	0.4	.	.
Myrica cerifera	wax-myrtle	8	.	.	0.4	.	.
Potamogeton perfoliatus	redhead grass	7	.	.	0.4	.	.
Chlorophyceae	green algae	1	6	.	0.3	5.6	.
Polygonum punctatum	dotted smartweed	1	.	.	0.3	.	.
Rubus spp.	bramble	1	.	.	0.3	.	.
Ilex opaca	American holly	1	.	.	0.3	.	.
Scirpus spp.	bulrush	1	.	.	0.2	.	.
Festuca elatior	meadow fescue	1	.	.	0.2	.	.
Ipomoea hederacea	morning glory	1	.	.	0.2	.	.
Spartina alterniflora (stricta)	saltmarsh cordgrass	1	.	.	0.1	.	.
Pinus Taeda	loblolly pine	5	.	.	0.1	.	.
Prunus serotina	wild cherry (black cherry)	1	.	.	0.1	.	.
Secale cereale	rye	1	.	.	0.1	.	.
Smilax rotundifolia	lily	1	.	.	0.0	.	.
Myriophyllum spicatum	Eurasian watermilfoil	1	.	.	0.0	.	.
Carpinus caroliniana	hornbeam (blue beech)	1	.	.	0.0	.	.
Ulva spp.	sea lettuce	1	.	.	0.0	.	.
Potamogeton pusillus	slender pondweed	1	.	.	0.0	.	.
Zannichellia palustris	horned pondweed	1	.	.	0.0	.	.
Scirpus robustus	saltmarsh bulrush	3	.	.	0.0	.	.
Carex spp.	sedge	1	.	.	0.0	.	.
Polygonum hydropiperoides	swamp smartweed	1	.	.	0.0	.	.
Rhus Copallinum	sumac	1	.	.	0.0	.	.
Cuscuta spp.	dodder	1	.	.	0.0	.	.
Iva frutescens	marsh-elder	1	.	.	0.0	.	.
Magnolia virginiana	sweet bay (swamp bay)	1	.	.	0.0	.	.
	Total plant material	87	100	.	57.9	98.6	.

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE D-6. FOOD ITEMS OF REDHEADS IN CHESAPEAKE BAY DURING THE PERIOD 1970 - 1979

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (7)	Gullet (.)	Unknown (3)	Gizzard (7)	Gullet (.)	Unknown (3)
Crepidula fornicata	common slipper shell	.	.	67	.	.	0.0
Erichsonella attenuata	isopod	.	.	33	.	.	0.0
Electra crustulenta	lacy crust	.	.	100	.	.	0.0
Macoma mitchelli (M. phenax)	Mitchell's clam	14	.	.	2.9	.	.
Molgula manhattensis	sea grape	29	.	.	0.4	.	.
Rangia cuneata	brackish water clam	29	.	33	0.1	.	0.0
Littorina irrorata	marsh periwinkle	14	.	.	0.0	.	.
Pelecypoda (Bivalvia)	bivalve	14	.	.	0.0	.	.
Balanus spp.	barnacle	14	.	.	0.0	.	.
	Total animal material	86	.	100	3.4	.	0.0
Zostera marina	eelgrass	86	.	100	85.0	.	100.0
Polygonum punctatum	dotted smartweed	14	.	.	2.9	.	.
Crataegus spp.	hawthorn	14	.	.	2.9	.	.
Ipomoea hederacea	morning glory	14	.	.	2.9	.	.
	undetermined vegetation	14	.	.	2.9	.	.
Ruppia maritima	widgeongrass	29	.	.	0.1	.	.
Myrica cerifera	wax-myrtle	14	.	.	0.0	.	.
	Total plant material	100	.	100	96.6	.	100.0

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE D-7. FOOD ITEMS OF GREEN-WINGED TEAL IN CHESAPEAKE BAY DURING THE PERIOD 1970 - 1979

Scientific name	Common name	Frequency occurrence Gizzard (29)	Frequency occurrence Gullet (.)	Frequency occurrence Unknown (.)	Aggregate percent[a] Gizzard (29)	Aggregate percent[a] Gullet (.)	Aggregate percent[a] Unknown (.)
Libelluidae	common skimmer	3	.	.	3.0	.	.
Asellus spp.		3	.	.	2.6	.	.
	undetermind animal	10	.	.	1.3	.	.
Corixidae	water boatman	3	.	.	0.6	.	.
Hymenoptera	bee, wasp, ant	3	.	.	0.6	.	.
Formicidae	ant	3	.	.	0.6	.	.
Coleoptera	beetle	3	.	.	0.0	.	.
Carabidae	ground beetle	3	.	.	0.0	.	.
Lepidoptera	butterfly, moth	3	.	.	0.0	.	.
Orthoptera	grasshopper, cricket	3	.	.	0.0	.	.
Aphidae	aphid, plantlice	3	.	.	0.0	.	.
Chironomidae	midge	3	.	.	0.0	.	.
Pectinatella magnifica	bryozoan	7	.	.	0.0	.	.
	Total animal material	38	.	.	8.7	.	.
Cyperus albomarginatus	galingale	59	.	.	26.3	.	.
Cyperus erythrorhizos	redroot cyperus	59	.	.	21.5	.	.
Cyperus odorattes	galingale	41	.	.	5.9	.	.
Zea mays	corn	3	.	.	3.3	.	.
Scirpus validus	softstem bulrush	41	.	.	3.2	.	.
Cephalanthus occidentalis	buttonbush	38	.	.	2.6	.	.
Polygonum punctatum	dotted smartweed	24	.	.	2.6	.	.
Rhus radicans	poison ivy - poison oak	17	.	.	2.6	.	.
Panicum dichotomiflorum	panic grass	24	.	.	2.5	.	.
Cladophora spp.	green algae	7	.	.	2.3	.	.
Polygonum lapathifolium	nodding smartweed	14	.	.	2.3	.	.
Myriophyllum spicatum	Eurasian watermilfoil	7	.	.	2.3	.	.
Carpinus caroliniana	hornbeam (blue beech)	17	.	.	1.9	.	.
Sparganium americanum	eastern burreed	7	.	.	1.6	.	.
Eleocharis palustris	common spikerush	7	.	.	1.4	.	.
Polygonum spp.	smartweed	14	.	.	1.3	.	.
Potamogeton pectinatus	sago pondweed	3	.	.	1.2	.	.
Elodea spp.		3	.	.	0.7	.	.
Eleocharis obtusa	blunt spikerush	3	.	.	0.7	.	.
Scirpus Olneyi	olney threesquare	3	.	.	0.7	.	.
Carex spp.	sedge	3	.	.	0.7	.	.
Ambrosia artemisiifolia	ragweed	3	.	.	0.7	.	.
	undetermined vegetation	3	.	.	0.7	.	.
Lespedeza striata	Japanese clover	3	.	.	0.6	.	.
Plantago spp.	plantain	7	.	.	0.6	.	.
Panicum anceps	panic grass	7	.	.	0.4	.	.
Aneilema Keisak	marsh day-flower	3	.	.	0.2	.	.

(continued)

APPENDIX TABLE D-7. (continued)

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (29)	Gullet (.)	Unknown (.)	Gizzard (29)	Gullet (.)	Unknown (.)
Polygonum Hydropiper	smartweed	7	.	.	0.2	.	.
Cyperus strigosus	galingale	14	.	.	0.2	.	.
Digitaria Ischaemum	crab grass	7	.	.	0.1	.	.
Digitaria sanguinalis	crab grass	3	.	.	0.1	.	.
Polygonum densiflorum	southern smartweed	3	.	.	0.1	.	.
Eleocharis quadrangulata	squarestem spikerush	3	.	.	0.0	.	.
Echinochloa crusgalli	barnyard grass	3	.	.	0.0	.	.
Echinochloa Walteri		3	.	.	0.0	.	.
Ranunculus bulbosus	buttercup	3	.	.	0.0	.	.
Carex festucacea	sedge	7	.	.	0.0	.	.
Carex lurida	sedge	7	.	.	0.0	.	.
Paspalum laeve	grass	3	.	.	0.0	.	.
Setaria lutescens	foxtail grass	3	.	.	0.0	.	.
Alnus serrulata	smooth alder	7	.	.	0.0	.	.
Boehemeria cylindrica	false nettle	3	.	.	0.0	.	.
Amaranthus spp.	amaranth	3	.	.	0.0	.	.
Rubus spp.	bramble	3	.	.	0.0	.	.
Vitis spp.	grape, wild grape	3	.	.	0.0	.	.
Cuscuta spp.	dodder	10	.	.	0.0	.	.
Verbena urticifolia	vervain	3	.	.	0.0	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	3	.	.	0.0	.	.
Compositae	composite	3	.	.	0.0	.	.
	Total plant material	100	.	.	91.3	.	.

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE D-8. FOOD ITEMS OF BLACK DUCKS IN CHESAPEAKE BAY DURING THE PERIOD 1970 - 1979

Scientific name	Common name	Frequency occurrence Gizzard (57)	Frequency occurrence Gullet (5)	Frequency occurrence Unknown (.)	Aggregate percent[a] Gizzard (57)	Aggregate percent[a] Gullet (5)	Aggregate percent[a] Unknown (.)
Lymnaea columella		.	20	.	.	0.2	.
Cyathura polita	isopod	.	20	.	.	0.2	.
Diplopoda	milliped	.	20	.	.	0.2	.
Staphylinidae	rove beetle	.	20	.	.	0.0	.
Trichoptera	caddisfly	.	20	.	.	0.0	.
Tipulidae	crane fly	.	20	.	.	0.2	.
Tabanidae	horsefly, deerfly	.	20	.	.	0.0	.
Libelluidae	common skimmer	.	40	.	.	0.6	.
Fundulus heteroclites		5	.	.	3.2	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	19	.	.	3.0	.	.
Brachiodontes recurvus (Mytilus)	hooked mussel	4	.	.	2.6	.	.
Balanus eburneus	ivory barnacle	5	.	.	2.3	.	.
Macoma balthica	Baltic macoma	11	.	.	1.6	.	.
Balanus spp.	barnacle	2	.	.	1.5	.	.
Gammarus spp.	scud	2	20	.	1.3	0.2	.
Melampus bidentatus	salt marsh snail	11	.	.	0.8	.	.
Corbicula manilensis	Asiatic fresh-water clam	5	.	.	0.4	.	.
Macoma mitchelli (M. phenax)	Mitchell's clam	4	.	.	0.4	.	.
Pisidium spp.	fresh-water clam	2	.	.	0.1	.	.
Rhithropaneopeus harrisi	white-fingered mud crab	4	.	.	0.1	.	.
Nereis spp.	clam worm	2	.	.	0.1	.	.
Hydrobia spp. (Littoridinops)	swamp snail	2	.	.	0.0	.	.
Amnicola spp.	amnicola	2	.	.	0.0	.	.
Phyllophaga spp.	June beetle	2	.	.	0.0	.	.
	undetermind animal	5	20	.	0.0	0.0	.
Heliosoma spp. (Planorbis spp.)	orb snail	2	.	.	0.0	.	.
Congeria leucophaeta	Conrad's false mussel	2	.	.	0.0	.	.
Lumbricidae		2	40	.	0.0	0.0	.
Amphipoda	scud, sideswimmer	7	.	.	0.0	.	.
Physa spp.	snail	2	.	.	0.0	.	.
Odostomia spp.	odostome	2	.	.	0.0	.	.
Amnicoliidae (Bulimidae)	swamp snail	2	.	.	0.0	.	.
Macoma tenta	narrowed macoma	2	.	.	0.0	.	.
Isopoda	isopod	2	.	.	0.0	.	.
Erichsonella spp.	isopod	2	.	.	0.0	.	.
Edotea spp.		2	.	.	0.0	.	.
Orchestia spp.	amphipod	2	20	.	0.0	0.0	.
Corophium spp.	amphipod	4	.	.	0.0	.	.
Podocopa	ostracod	2	.	.	0.0	.	.
Haliplidae	crawling water beetle	2	.	.	0.0	.	.
Coelambus spp.		2	.	.	0.0	.	.
Curculionidae	snout beetle	5	40	.	0.0	0.0	.

(continued)

APPENDIX TABLE D-8. (continued)

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (57)	Gullet (5)	Unknown (.)	Gizzard (57)	Gullet (5)	Unknown (.)
Carabidae	ground beetle	2	20	.	0.0	0.0	.
Elateridae	click beetle	2	20	.	0.0	0.0	.
Belastoma spp.		5	.	.	0.0	.	.
Pentatomidae	stink bug	2	.	.	0.0	.	.
Hymenoptera	bee, wasp, ant	2	.	.	0.0	.	.
Formicidae	ant	5	40	.	0.0	0.0	.
Pyralidae	pyralid moths	2	.	.	0.0	.	.
Zygoptera	damselfly	2	.	.	0.0	.	.
Araneae	spider	2	.	.	0.0	.	.
Dolomedes spp.	fishing spider	2	.	.	0.0	.	.
	undetermined fish	4	.	.	0.0	.	.
	Total animal material	58	100	.	17.4	1.6	.
Eleocharis parvula	dwarf spikerush	.	20	.	.	0.0	.
Panicum clandestinum		.	20	.	.	0.0	.
Andropogon Gerardi	beard grass	.	20	.	.	0.2	.
Muhlenbergia frondosa	muhly	.	20	.	.	0.4	.
Boehemeria cylindrica	false nettle	.	20	.	.	0.0	.
Chenopodium spp.	goosefoot	.	20	.	.	0.0	.
Rumex spp.	dock, sorrel	.	20	.	.	0.0	.
Acalypha spp.	three-seeded mercury	.	20	.	.	0.0	.
Galium spp.	bedstraw, cleavers	.	20	.	.	0.0	.
Polygonum punctatum	dotted smartweed	35	40	.	9.9	9.0	.
Ruppia maritima	widgeongrass	39	.	.	9.6	.	.
Leersia oryzoides	cut grass	16	40	.	8.5	38.0	.
Panicum dichotomiflorum	panic grass	23	20	.	5.7	0.4	.
Scirpus robustus	saltmarsh bulrush	12	.	.	3.4	.	.
Leptochloa fascicularis		7	.	.	3.2	.	.
Scirpus Olneyi	olney threesquare	9	.	.	2.6	.	.
Sorgum halapense	Johnson grass	9	.	.	2.6	.	.
Sparganium americanum	eastern burreed	14	.	.	2.5	.	.
Polygonum arifolium	halberdleaf tear-thumb	9	.	.	2.4	.	.
Potamogeton perfoliatus	redhead grass	19	.	.	2.4	.	.
Polygonum aviculare		4	20	.	2.3	16.0	.
Zea mays	corn	12	20	.	2.0	0.6	.
Nyssa sylvatica (biflora)	black gum (sour gum)	11	.	.	2.0	.	.
Spartina alterniflora (stricta)	saltmarsh cordgrass	12	40	.	1.9	9.8	.
Celtis occidentalis	hackberry	16	.	.	1.8	.	.
Pinus Taeda	loblolly pine	25	.	.	1.3	.	.
Distichlis spicata	salt grass	5	.	.	1.3	.	.
Polygonum spp.	smartweed	5	.	.	1.3	.	.
Aneilema Keisak	marsh day-flower	5	.	.	1.3	.	.
Zannichellia palustris	horned pondweed	2	.	.	1.1	.	.

(continued)

APPENDIX TABLE D-8. (continued)

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (57)	Gullet (5)	Unknown (.)	Gizzard (57)	Gullet (5)	Unknown (.)
Iva frutescens	marsh-elder	5	20	.	1.1	4.0	.
Carpinus caroliniana	hornbeam (blue beech)	9	.	.	1.0	.	.
Cladophora spp.	green algae	2	.	.	1.0	.	.
Echinochloa Walteri		7	20	.	1.0	0.6	.
Spartina patens	saltmeadow cordgrass	4	.	.	1.0	.	.
	undetermined vegetation	7	.	.	0.9	.	.
Cephalanthus occidentalis	buttonbush	7	.	.	0.8	.	.
Peltandra virginica	arrow arum	5	.	.	0.6	.	.
Cornus florida	flowering dogwood	5	.	.	0.6	.	.
Carya spp.	hickory	5	.	.	0.6	.	.
Prunus serotina	wild cherry (black cherry)	14	.	.	0.5	.	.
Ambrosia artemisiifolia	ragweed	5	.	.	0.4	.	.
Cyperus erythrorhizos	redroot cyperus	2	.	.	0.4	.	.
Cyperus albomarginatus	galingale	2	.	.	0.3	.	.
Rhus radicans	poison ivy - poison oak	12	.	.	0.3	.	.
Cyperus odorattes	galingale	9	.	.	0.3	.	.
Myrica pensylvanica	bayberry	2	.	.	0.3	.	.
Acnida cannabinus (amaranthus)	tidemarsh waterhemp	4	40	.	0.3	15.4	.
Polygonum pensylvanicum	smartweed	7	20	.	0.2	0.6	.
Chara spp.	muskgrass	2	.	.	0.2	.	.
Vitis spp.	grape, wild grape	5	40	.	0.2	0.0	.
Setaria Faberii	foxtail grass	7	.	.	0.1	.	.
Phytolacca americana	pokeweed	9	.	.	0.1	.	.
Quercus spp.	oak	9	.	.	0.1	.	.
Polygonum lapathifolium	nodding smartweed	9	.	.	0.1	.	.
Cyperus esculentus	galingale	5	.	.	0.1	.	.
Gramineae	grasses	2	.	.	0.1	.	.
Digitaria filiformis	crab grass	5	20	.	0.1	3.2	.
Myrica cerifera	wax-myrtle	12	.	.	0.1	.	.
Potamogeton pusillus	slender pondweed	4	.	.	0.1	.	.
Scirpus americanus	common threesquare	9	.	.	0.1	.	.
Echinochloa crusgalli	barnyard grass	9	20	.	0.1	0.0	.
Vitaceae	grape	9	.	.	0.1	.	.
Hibiscus Moscheutos	rose-mallow	4	.	.	0.1	.	.
Crataegus spp.	hawthorn	4	.	.	0.1	.	.
Scirpus validus	softstem bulrush	7	.	.	0.0	.	.
Quercus Phellos	willow-oak	2	.	.	0.0	.	.
Cornus Amomum	dogwood	2	.	.	0.0	.	.
Paspalum ciliatifolium		5	.	.	0.0	.	.
Smilax rotundifolia	lily	2	.	.	0.0	.	.
Iris Pseudacorus	water-flag	2	.	.	0.0	.	.
Stellaria media	chickweed (starwort)	2	.	.	0.0	.	.
Liquidambar styraciflua	sweet gum (red gum)	4	.	.	0.0	.	.

(continued)

APPENDIX TABLE D-8. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (57)	Frequency occurrence Gullet (5)	Frequency occurrence Unknown (.)	Aggregate percent[a] Gizzard (57)	Aggregate percent[a] Gullet (5)	Aggregate percent[a] Unknown (.)
Acalypha rhomboidea	three-seeded mercury	7	.	.	0.0	.	.
Trifolium repens	white clover	2	20	.	0.0	0.0	.
Ilex decidua	holly	2	.	.	0.0	.	.
Ilex opaca	American holly	4	.	.	0.0	.	.
Plantago lanceolata	English plantain	2	.	.	0.0	.	.
Aster tenuifolius		2	.	.	0.0	.	.
Ulva lactuca	sea lettuce	2	.	.	0.0	.	.
Cyperus spp.	galingale	2	.	.	0.0	.	.
Eleocharis obtusa	blunt spikerush	4	.	.	0.0	.	.
Eleocharis quadrangulata	squarestem spikerush	2	.	.	0.0	.	.
Cladium mariscoides	twig-rush	2	.	.	0.0	.	.
Scirpus spp.	bulrush	2	.	.	0.0	.	.
Carex spp.	sedge	4	.	.	0.0	.	.
Eleusine indica	yard grass	2	20	.	0.0	0.2	.
Digitaria sanguinalis	crab grass	4	20	.	0.0	0.0	.
Panicum virgatum	panic grass	2	20	.	0.0	0.0	.
Setaria lutescens	foxtail grass	2	.	.	0.0	.	.
Muhlenbergia spp.		2	.	.	0.0	.	.
Smilax spp.	lily	2	.	.	0.0	.	.
Discorea villosa	wild yam	2	.	.	0.0	.	.
Alnus serrulata	smooth alder	2	.	.	0.0	.	.
Chenopodium album	lamb's quarters	2	20	.	0.0	0.0	.
Amaranthus spp.	amaranth	2	.	.	0.0	.	.
Rumex crispus	sour dock	4	.	.	0.0	.	.
Polygonum Hydropiper	smartweed	4	.	.	0.0	.	.
Polygonum hydropiperoides	swamp smartweed	5	.	.	0.0	.	.
Polygonum Persicaria	smartweed	2	.	.	0.0	.	.
Ranunculaceae	crowfoot	2	.	.	0.0	.	.
Rosa spp.	rose	2	.	.	0.0	.	.
Rosa palustris	swamp rose	2	.	.	0.0	.	.
Rubus spp.	bramble	5	.	.	0.0	.	.
Rhus Copallinum	sumac	9	.	.	0.0	.	.
Cuscuta spp.	dodder	9	.	.	0.0	.	.
Compositae	composite	2	.	.	0.0	.	.
Bidens spp.	beggar-tick	2	.	.	0.0	.	.
Aster spp.	aster	2	.	.	0.0	.	.
Solanum nigrum	black nightshade	2	.	.	0.0	.	.
Euphorbia spp.	spurge	2	.	.	0.0	.	.
	Total plant material	98	100	.	82.6	98.4	.

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE D-9. FOOD ITEMS OF MALLARDS IN CHESAPEAKE BAY DURING THE PERIOD 1970 - 1979

Scientific name	Common name	Frequency occurrence Gizzard (84)	Frequency occurrence Gullet (6)	Frequency occurrence Unknown (2)	Aggregate percent[a] Gizzard (84)	Aggregate percent[a] Gullet (6)	Aggregate percent[a] Unknown (2)
Orchestia agilis	amphipod	.	17	.	.	0.0	.
Corophium spp.	amphipod	.	17	.	.	0.0	.
Popillia japonica	Japanese beetle	.	17	.	.	0.0	.
Berosus spp.		.	17	.	.	0.0	.
Macoma balthica	Baltic macoma	5	.	50	3.0	.	0.5
Brachiodontes recurvus (Mytilus)	hooked mussel	2	.	.	1.1	.	.
Balanus spp.	barnacle	5	.	.	0.9	.	.
Goniobasis virginica	snail	2	.	.	0.7	.	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	4	.	.	0.5	.	.
Gammarus fasciatus	scud	1	.	.	0.4	.	.
Corbicula manilensis	Asiatic fresh-water clam	13	.	.	0.2	.	.
Corbicula fluminea		1	.	.	0.1	.	.
Pelecypoda (Bivalvia)	bivalve	1	.	.	0.1	.	.
Asellus spp.		1	.	.	0.1	.	.
Physa spp.	snail	2	.	.	0.0	.	.
Dolomedes spp.	fishing spider	2	.	.	0.0	.	.
Melampus bidentatus	salt marsh snail	1	33	50	0.0	0.2	0.0
Pisidium spp.	fresh-water clam	5	33	50	0.0	1.0	2.5
Sphaerium spp.	sphere shell	1	.	.	0.0	.	.
Orchestia spp.	amphipod	1	.	.	0.0	.	.
Carabidae	ground beetle	2	.	.	0.0	.	.
Trichoptera	caddisfly	1	.	.	0.0	.	.
	undetermind animal	1	.	.	0.0	.	.
Gastropoda	snail, limpet	2	.	.	0.0	.	.
Nereis spp.	clam worm	1	.	.	0.0	.	.
Lumbricidae		1	.	.	0.0	.	.
Crustacea	crustacean	1	.	.	0.0	.	.
Cyathura polita	isopod	1	.	.	0.0	.	.
Amphipoda	scud, sideswimmer	1	.	.	0.0	.	.
Palaemonetes spp.	grass shrimp	1	.	.	0.0	.	.
Chilognatha		1	.	.	0.0	.	.
Coleoptera	beetle	1	.	.	0.0	.	.
Dytiscus spp.	predaceous diving beetle	1	.	.	0.0	.	.
Hydrophilidae	water scavenger beetle	2	.	.	0.0	.	.
Elateridae	click beetle	1	.	.	0.0	.	.
Tenebrionidae	darkling beetle	1	.	.	0.0	.	.
Formicidae	ant	1	.	.	0.0	.	.
Acrididae (Locustidae)	short-horned grasshopper	1	.	.	0.0	.	.
Tipulidae	crane fly	1	17	.	0.0	0.3	.
	Total animal material	46	50	100	7.3	1.5	3.0
Panicum virgatum	panic grass	.	17	.	.	0.0	.

(continued)

APPENDIX TABLE D-9. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (84)	Frequency occurrence Gullet (6)	Frequency occurrence Unknown (2)	Aggregate percent[a] Gizzard (84)	Aggregate percent[a] Gullet (6)	Aggregate percent[a] Unknown (2)
Spartina cynosuroides	big cordgrass	.	.	50	.	.	0.0
Andropogon spp.	beard grass	.	17	.	.	0.0	.
Rhus glabra	smooth sumac	.	17	.	.	0.0	.
Helianthus spp.	sunflower	.	17	.	.	0.0	.
Zea mays	corn	21	17	50	15.8	16.7	49.5
Polygonum punctatum	dotted smartweed	37	50	.	7.9	32.2	.
Leersia oryzoides	cut grass	19	33	.	7.3	16.8	.
Stellaria media	chickweed (starwort)	10	.	.	6.0	.	.
Polygonum arifolium	halberdleaf tear-thumb	15	.	.	6.0	.	.
Scirpus Olneyi	olney threesquare	6	.	.	3.7	.	.
Glycine Max	soy bean	6	.	.	2.8	.	.
Aneilema Keisak	marsh day-flower	7	.	.	2.7	.	.
Ruppia maritima	widgeongrass	17	.	.	2.7	.	.
Cephalanthus occidentalis	buttonbush	14	.	.	2.4	.	.
Sorgum halapense	Johnson grass	6	.	.	2.2	.	.
Sparganium americanum	eastern burreed	19	.	.	2.2	.	.
Peltandra virginica	arrow arum	5	.	.	2.1	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	15	.	.	1.8	.	.
Carpinus caroliniana	hornbeam (blue beech)	13	.	.	1.7	.	.
Scirpus validus	softstem bulrush	17	.	.	1.6	.	.
Echinochloa crusgalli	barnyard grass	8	17	.	1.5	6.3	.
Panicum dichotomiflorum	panic grass	10	17	.	1.2	0.0	.
Vigna sinensis	cow-pea	1	.	.	1.2	.	.
Vallisneria americana (spiralis)	wildcelery	1	17	.	1.2	16.7	.
Cyperus erythrorhizos	redroot cyperus	2	.	.	1.2	.	.
Cyperus odorattes	galingale	6	.	.	1.1	.	.
Leersia virginica	white grass	1	.	.	1.1	.	.
Polygonum pensylvanicum	smartweed	11	.	.	1.0	.	.
Potamogeton perfoliatus	redhead grass	12	.	.	1.0	.	.
Gramineae	grasses	6	.	.	0.9	.	.
	undetermined vegetation	4	17	.	0.9	0.0	.
Ulva lactuca	sea lettuce	1	.	.	0.8	.	.
Iva frutescens	marsh-elder	5	17	50	0.8	0.8	10.0
Cladium mariscoides	twig-rush	8	.	.	0.6	.	.
Liquidambar styraciflua	sweet gum (red gum)	2	.	.	0.6	.	.
Pinus Taeda	loblolly pine	12	.	.	0.6	.	.
Proserpinaca palustris	marsh mermaidweed	1	.	.	0.5	.	.
Digitaria sanguinalis	crab grass	7	.	.	0.4	.	.
Chenopodium album	lamb's quarters	4	.	.	0.4	.	.
Alnus serrulata	smooth alder	4	.	.	0.4	.	.
Potamogeton spp.	pondweed	1	.	.	0.4	.	.
Scirpus robustus	saltmarsh bulrush	4	17	50	0.3	0.0	7.5
Polygonum spp.	smartweed	5	.	.	0.3	.	.

(continued)

APPENDIX TABLE D-9. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (84)	Frequency occurrence Gullet (6)	Frequency occurrence Unknown (2)	Aggregate percent[a] Gizzard (84)	Aggregate percent[a] Gullet (6)	Aggregate percent[a] Unknown (2)
Polygonum hydropiperoides	swamp smartweed	6	.	.	0.3	.	.
Polygonum Persicaria	smartweed	5	.	.	0.3	.	.
Ranunculus bulbosus	buttercup	4	.	.	0.3	.	.
Cornus Amomum	dogwood	2	.	.	0.3	.	.
Spartina alterniflora (stricta)	saltmarsh cordgrass	4	17	.	0.3	0.2	.
Cyperus esculentus	galingale	1	.	.	0.2	.	.
Eleocharis spp.	spikerush	1	.	.	0.2	.	.
Acnida cannabinus (amaranthus)	tidemarsh waterhemp	2	17	50	0.2	2.5	30.0
Polygonum Hydropiper	smartweed	4	17	.	0.2	2.8	.
Vitaceae	grape	1	.	.	0.2	.	.
Carex lurida	sedge	5	.	.	0.2	.	.
Rhus Toxicodendron	poison-oak	4	.	.	0.2	.	.
Scirpus americanus	common threesquare	7	.	.	0.2	.	.
Carex scoparia	sedge	1	.	.	0.2	.	.
Setaria Faberii	foxtail grass	2	17	.	0.2	3.3	.
Myrica cerifera	wax-myrtle	12	.	.	0.2	.	.
Ilex opaca	American holly	4	.	.	0.2	.	.
Digitaria spp.	crab grass	1	.	.	0.2	.	.
Cynodon Dactylon	bermuda grass (wire grass)	1	.	.	0.1	.	.
Ampelopsis spp.		1	.	.	0.1	.	.
Ambrosia trifida	ragweed	4	.	.	0.1	.	.
Glyceria striata	manna grass	1	.	.	0.1	.	.
Sagittaria latifolia	broadleaf arrowhead	1	.	.	0.1	.	.
Polygonum sagittatum	smartweed	1	.	.	0.1	.	.
Cyperus strigosus	galingale	2	.	.	0.1	.	.
Eleocharis palustris	common spikerush	4	.	.	0.1	.	.
Digitaria filiformis	crab grass	4	.	.	0.1	.	.
Quercus spp.	oak	5	.	.	0.1	.	.
Celtis occidentalis	hackberry	2	.	.	0.1	.	.
Polygonum virginianum (Tovara)		2	.	.	0.1	.	.
Cyperus albomarginatus	galingale	4	.	.	0.0	.	.
Echinochloa Walteri		7	17	.	0.0	0.2	.
Commelina communis	day-flower	1	.	.	0.0	.	.
Vitis spp.	grape, wild grape	8	.	.	0.0	.	.
Rhus radicans	poison ivy - poison oak	6	.	.	0.0	.	.
Ilex decidua	holly	6	.	.	0.0	.	.
Eleocharis quadrangulata	squarestem spikerush	4	.	.	0.0	.	.
Smilax Walteri	lily	1	.	.	0.0	.	.
Quercus palustris	pin-oak	1	.	.	0.0	.	.
Amaranthus spp.	amaranth	5	.	.	0.0	.	.
Polygonum lapathifolium	nodding smartweed	1	.	.	0.0	.	.
Phytolacca americana	pokeweed	1	.	.	0.0	.	.
Rubus spp.	bramble	6	.	.	0.0	.	.

(continued)

APPENDIX TABLE D-9. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (84)	Frequency occurrence Gullet (6)	Frequency occurrence Unknown (2)	Aggregate percent[a] Gizzard (84)	Aggregate percent[a] Gullet (6)	Aggregate percent[a] Unknown (2)
Prunus serotina	wild cherry (black cherry)	1	.	.	0.0	.	.
Carex intumescens		1	.	.	0.0	.	.
Paspalum ciliatifolium		1	.	.	0.0	.	.
Smilax rotundifolia	lily	2	.	.	0.0	.	.
Crataegus spp.	hawthorn	1	.	.	0.0	.	.
Ilex verticillata	black alder (winterberry)	2	.	.	0.0	.	.
Vitis vulpina (cordifolia)	forest-grape	1	.	.	0.0	.	.
Potamogeton pectinatus	sago pondweed	1	.	.	0.0	.	.
Zannichellia palustris	horned pondweed	1	.	.	0.0	.	.
Eleocharis Engelmanni		1	.	.	0.0	.	.
Scirpus fluviatilis	river bulrush	1	.	.	0.0	.	.
Carex spp.	sedge	6	.	.	0.0	.	.
Arthraxon hispidus	grass	1	.	.	0.0	.	.
Eleusine indica	yard grass	1	.	.	0.0	.	.
Digitaria Ischaemum	crab grass	1	.	.	0.0	.	.
Echinochloa spp.		1	.	.	0.0	.	.
Festuca spp.		1	.	.	0.0	.	.
Panicum clandestinum		1	.	.	0.0	.	.
Paspalum spp.	grass	1	.	.	0.0	.	.
Setaria spp.	foxtail grass	2	.	.	0.0	.	.
Setaria lutescens	foxtail grass	1	.	.	0.0	.	.
Setaria glauca	foxtail grass	1	.	.	0.0	.	.
Sorgum vulgare	grass	1	.	.	0.0	.	.
Eulalia viminea		1	.	.	0.0	.	.
Smilax spp.	lily	1	.	.	0.0	.	.
Discorea villosa	wild yam	1	.	.	0.0	.	.
Boehemeria cylindrica	false nettle	1	.	.	0.0	.	.
Rumex spp.	dock, sorrel	1	.	.	0.0	.	.
Acalypha rhomboidea	three-seeded mercury	1	.	.	0.0	.	.
Rosa spp.	rose	1	.	.	0.0	.	.
Vicia spp.	vetch	1	.	.	0.0	.	.
Lespedeza spp.	bush-clover	2	.	.	0.0	.	.
Rhus Copallinum	sumac	4	.	.	0.0	.	.
Abutilon Theophrasti	velvet-leaf (pie-marker)	1	.	.	0.0	.	.
Cuscuta spp.	dodder	8	.	.	0.0	.	.
Plantago spp.	plantain	1	.	.	0.0	.	.
Compositae	composite	1	.	.	0.0	.	.
Ambrosia artemisiifolia	ragweed	4	.	.	0.0	.	.
Eclipta alba	composite	1	.	.	0.0	.	.
Carya spp.	hickory	1	.	.	0.0	.	.
	Total plant material	98	100	100	92.7	98.5	97.0

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[a] As defined by Swanson et al. (1974).

APPENDIX TABLE D-10. FOOD ITEMS OF PINTAILS IN CHESAPEAKE BAY DURING THE PERIOD 1970 - 1979

Scientific name	Common name	Frequency occurrence			Aggregate percent[a]		
		Gizzard (27)	Gullet (8)	Unknown (.)	Gizzard (27)	Gullet (8)	Unknown (.)
Hydrobia spp. (Littoridinops)	swamp snail	.	25	.	.	0.0	.
Arcuatula demissa (Volsella)	Atlantic ribbed mussel	.	13	.	.	0.0	.
Modiolus spp. (Volsella)	mussel	.	13	.	.	0.0	.
Cyathura polita	isopod	.	38	.	.	0.0	.
Asellus spp.		.	25	.	.	0.3	.
Corophium spp.	amphipod	.	25	.	.	0.4	.
Podocopa	ostracod	.	13	.	.	0.0	.
Dytiscidae	predaceous diving beetle	.	13	.	.	0.0	.
Canthydrus puncticollis		.	13	.	.	0.0	.
Hydrophilidae	water scavenger beetle	.	13	.	.	0.0	.
Carabidae	ground beetle	.	25	.	.	0.0	.
Acrididae (Locustidae)	short-horned grasshopper	.	25	.	.	0.0	.
Diptera	fly	.	13	.	.	0.0	.
Odontomyia spp.		.	13	.	.	0.1	.
Culicoides spp.	punky	.	13	.	.	0.0	.
Tabanidae	horsefly, deerfly	.	25	.	.	0.0	.
Corbicula manilensis	Asiatic fresh-water clam	15	.	.	3.9	.	.
Libelluidae	common skimmer	4	13	.	0.4	0.0	.
Amnicoliidae (Bulimidae)	swamp snail	7	25	.	0.2	1.9	.
Heliosoma spp. (Planorbis spp.)	orb snail	7	.	.	0.1	.	.
Pisidium spp.	fresh-water clam	4	38	.	0.1	1.9	.
Rhithropaneopeus harrisi	white-fingered mud crab	4	.	.	0.1	.	.
Belastoma spp.		7	13	.	0.1	0.0	.
Nereis spp.	clam worm	4	.	.	0.0	.	.
Melampus bidentatus	salt marsh snail	4	38	.	0.0	0.1	.
Oligochaeta	aquatic earthworm	4	.	.	0.0	.	.
Cassidinidea lunifrons		4	38	.	0.0	1.4	.
Curculionidae	snout beetle	4	.	.	0.0	.	.
Gerridae	water strider	4	.	.	0.0	.	.
Hymenoptera	bee, wasp, ant	4	.	.	0.0	.	.
Formicidae	ant	7	13	.	0.0	0.0	.
Lepidoptera	butterfly, moth	4	13	.	0.0	0.0	.
Coleophoridae	casebearer	4	13	.	0.0	0.0	.
Orthoptera	grasshopper, cricket	4	.	.	0.0	.	.
Hydracarina (Acarina)	mite	4	13	.	0.0	0.0	.
	undetermined fish	4	.	.	0.0	.	.
	Total animal material	56	100	.	4.8	6.0	.
Cyperus esculentus	galingale	.	13	.	.	0.3	.
Setaria Faberii	foxtail grass	.	13	.	.	0.0	.
Amaranthus hybridus	prince's feather	.	13	.	.	0.0	.
Liquidambar styraciflua	sweet gum (red gum)	.	13	.	.	0.0	.

(continued)

APPENDIX TABLE D-10. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (27)	Frequency occurrence Gullet (8)	Frequency occurrence Unknown (.)	Aggregate percent[a] Gizzard (27)	Aggregate percent[a] Gullet (8)	Aggregate percent[a] Unknown (.)
Cassia fasciculata	partridge-pea (locust-weed)	.	13	.	.	0.0	.
Aster puniceus	wild aster	.	13	.	.	0.0	.
Aster spp.	aster	.	25	.	.	0.0	.
Polygonum punctatum	dotted smartweed	67	75	.	14.9	12.5	.
Zea mays	corn	19	25	.	14.3	0.0	.
Leersia oryzoides	cut grass	15	13	.	6.7	0.0	.
Echinochloa crusgalli	barnyard grass	15	38	.	6.4	24.4	.
Acnida cannabinus (amaranthus)	tidemarsh waterhemp	22	75	.	6.0	20.4	.
Cephalanthus occidentalis	buttonbush	30	.	.	4.9	.	.
Panicum dichotomiflorum	panic grass	22	50	.	4.0	7.5	.
Aneilema Keisak	marsh day-flower	15	.	.	4.0	.	.
Cyperus albomarginatus	galingale	19	13	.	3.6	0.0	.
Echinochloa Walteri		22	50	.	2.6	0.8	.
Carpinus caroliniana	hornbeam (blue beech)	15	.	.	2.2	.	.
Pontederia cordata	pickerel weed (tuckahoe)	7	25	.	2.0	5.9	.
Sparganium americanum	eastern burreed	26	13	.	1.9	0.3	.
Phaseolus vulgaris	common bean	4	13	.	1.8	10.5	.
Polygonum arifolium	halberdleaf tear-thumb	15	25	.	1.7	4.1	.
Polygonum pensylvanicum	smartweed	15	38	.	1.7	0.5	.
Zannichellia palustris	horned pondweed	4	.	.	1.5	.	.
Nyssa sylvatica (biflora)	black gum (sour gum)	26	.	.	1.3	.	.
Ruppia maritima	widgeongrass	4	.	.	1.1	.	.
Lycopus uniflorus	bugle-weed	7	.	.	1.0	.	.
Cyperus rotundus	galingale	4	.	.	1.0	.	.
Scirpus validus	softstem bulrush	44	50	.	1.0	0.0	.
Peltandra virginica	arrow arum	7	25	.	1.0	1.1	.
Polygonum spp.	smartweed	7	.	.	1.0	.	.
Cuscuta spp.	dodder	22	25	.	0.8	0.0	.
Potamogeton perfoliatus	redhead grass	4	.	.	0.7	.	.
Festuca elatior	meadow fescue	4	.	.	0.6	.	.
Cyperus odorattes	galingale	11	.	.	0.4	.	.
Cyperus strigosus	galingale	15	.	.	0.4	.	.
Eleocharis obtusa	blunt spikerush	4	.	.	0.4	.	.
Eleocharis palustris	common spikerush	7	.	.	0.4	.	.
Eleocharis parvula	dwarf spikerush	4	.	.	0.4	.	.
Cladium mariscoides	twig-rush	4	.	.	0.4	.	.
Scirpus Olneyi	olney threesquare	7	.	.	0.4	.	.
Zizania aquatica	wildrice	7	25	.	0.4	1.3	.
Galium spp.	bedstraw, cleavers	4	.	.	0.4	.	.
Cyperus erythrorhizos	redroot cyperus	11	.	.	0.3	.	.
Myrica cerifera	wax-myrtle	11	13	.	0.3	0.0	.
Ilex opaca	American holly	15	.	.	0.2	.	.
Spartina alterniflora (stricta)	saltmarsh cordgrass	11	38	.	0.2	2.1	.

(continued)

APPENDIX TABLE D-10. (continued)

Scientific name	Common name	Frequency occurrence Gizzard (27)	Frequency occurrence Gullet (8)	Frequency occurrence Unknown (.)	Aggregate percent[a] Gizzard (27)	Aggregate percent[a] Gullet (8)	Aggregate percent[a] Unknown (.)
Digitaria filiformis	crab grass	7	38	.	0.1	1.5	.
Pinus Taeda	loblolly pine	11	13	.	0.1	0.0	.
Potamogeton pectinatus	sago pondweed	4	.	.	0.1	.	.
Cladium jamaicense	sawgrass	4	.	.	0.1	.	.
Scirpus robustus	saltmarsh bulrush	7	.	.	0.1	.	.
Digitaria sanguinalis	crab grass	7	38	.	0.1	0.0	.
Ilex decidua	holly	7	.	.	0.1	.	.
Cyperus Iria	galingale	4	13	.	0.1	0.4	.
Polygonum densiflorum	southern smartweed	7	.	.	0.1	.	.
Ambrosia artemisiifolia	ragweed	7	38	.	0.1	0.1	.
Scirpus americanus	common threesquare	4	.	.	0.0	.	.
Carex lurida	sedge	7	.	.	0.0	.	.
Panicum virgatum	panic grass	4	13	.	0.0	0.3	.
Paspalum laeve	grass	4	38	.	0.0	0.1	.
Portulaca oleracea	purslane	4	13	.	0.0	0.1	.
Potamogeton pusillus	slender pondweed	4	.	.	0.0	.	.
Sagittaria spp.	arrowhead	4	.	.	0.0	.	.
Eleocharis quadrangulata	squarestem spikerush	7	.	.	0.0	.	.
Cladium spp.		4	.	.	0.0	.	.
Carex spp.	sedge	4	.	.	0.0	.	.
Carex festucacea	sedge	7	.	.	0.0	.	.
Carex hormathodes	sedge	7	.	.	0.0	.	.
Carex hyalinolepis	lake sedge	7	.	.	0.0	.	.
Carex intumescens		4	.	.	0.0	.	.
Glyceria striata	manna grass	4	.	.	0.0	.	.
Setaria spp.	foxtail grass	4	13	.	0.0	0.0	.
Zizaniopsis miliacea	southern wild rice	4	.	.	0.0	.	.
Alnus serrulata	smooth alder	7	.	.	0.0	.	.
Quercus spp.	oak	4	.	.	0.0	.	.
Boehemeria cylindrica	false nettle	4	.	.	0.0	.	.
Rumex verticilliatus	water-dock	4	25	.	0.0	0.0	.
Polygonum Persicaria	smartweed	4	.	.	0.0	.	.
Ranunculus bulbosus	buttercup	4	.	.	0.0	.	.
Rubus spp.	bramble	7	38	.	0.0	0.0	.
Rhus radicans	poison ivy - poison oak	4	.	.	0.0	.	.
Vitis spp.	grape, wild grape	4	.	.	0.0	.	.
Cornus Amomum	dogwood	4	.	.	0.0	.	.
Compositae	composite	4	.	.	0.0	.	.
Iva frutescens	marsh-elder	4	.	.	0.0	.	.
Cicuta maculata	water-hemlock	4	50	.	0.0	0.0	.
	Total plant material	100	100	.	95.2	94.0	.

[a] As defined by Swanson et al. (1974).

APPENDIX TABLE E-1. FREQUENCY OCCURRENCE OF WIDGEONGRASS IN MARYLAND WATERFOWL SURVEY AREAS DURING THE YEARS 1971-1979[a]

Survey area[b]	Percent with vegetation, and sample size ( )								
	1971	1972	1973	1974	1975	1976	1977	1978	1979
Lower Choptank River	27.5 (51)	35.4 (48)	12.8 (47)	28.6 (49)	2.1 (47)	47.8 (46)	28.6 (49)	30.6 (49)	25.5 (47)
Manokin, Annemessex R.	24.6 (57)	9.1 (55)	10.7 (56)	23.5 (34)	9.6 (52)	12.3 (57)	8.9 (56)	3.6 (55)	0.0 (56)
Eastern Bay	21.4 (28)	20.8 (24)	10.7 (28)	21.4 (28)	11.1 (27)	37.0 (27)	11.1 (27)	11.1 (27)	7.4 (27)
Chester River	27.8 (36)	11.1 (36)	8.8 (34)	2.9 (34)	11.1 (36)	14.3 (35)	13.9 (36)	25.0 (36)	16.7 (36)
Smith Island (Maryland)	47.1 (17)	27.3 (11)	16.7 (12)	29.4 (17)	5.9 (17)	35.3 (17)	11.8 (17)	5.9 (17)	11.8 (17)
Miles River	37.5 (8)	50.0 (8)	50.0 (8)	50.0 (8)	25.0 (8)	42.9 (7)	50.0 (8)	50.0 (8)	0.0 (8)
Honga River	30.0 (30)	23.3 (30)	10.0 (30)	16.7 (30)	10.3 (29)	13.8 (29)	3.3 (30)	3.3 (30)	0.0 (30)
Wye River	18.2 (11)	36.4 (11)	36.4 (11)	54.5 (11)	27.3 (11)	36.4 (11)	27.3 (11)	36.4 (11)	18.2 (11)
Bloodsworth, South Marsh I.	20.0 (40)	2.3 (44)	8.7 (46)	4.7 (43)	4.7 (43)	2.2 (45)	2.2 (46)	0.0 (46)	0.0 (45)
Bayshore, Hooper Island	26.1 (23)	13.0 (23)	4.3 (23)	8.7 (23)	8.7 (23)	13.0 (23)	4.3 (23)	0.0 (23)	0.0 (23)
Magothy - Severn Rivers	22.2 (27)	11.1 (27)	7.4 (27)	18.5 (27)	. (0)	8.0 (25)	7.4 (27)	7.4 (27)	14.8 (27)
Little Choptank River	10.0 (30)	6.7 (30)	0.0 (30)	0.0 (30)	0.0 (30)	10.0 (30)	6.7 (30)	3.3 (30)	3.3 (30)
Patuxent River	0.0 (50)	4.4 (45)	0.0 (50)	2.0 (50)	0.0 (47)	2.0 (49)	0.0 (49)	0.0 (50)	0.0 (48)
Fishing Bay	8.0 (25)	0.0 (25)	0.0 (25)	0.0 (25)	0.0 (24)	0.0 (25)	0.0 (25)	0.0 (25)	0.0 (24)
Patapsco R., Aberdeen P.G.	1.9 (52)	0.0 (50)	0.0 (50)	0.0 (52)	0.0 (22)	0.0 (52)	0.0 (52)	0.0 (52)	0.0 (52)
Bayshore, Kent Island	0.0 (8)	0.0 (8)	0.0 (8)	12.5 (8)	0.0 (8)	0.0 (8)	0.0 (8)	0.0 (8)	0.0 (8)
South River, Herring Bay	0.0 (21)	0.0 (21)	0.0 (21)	0.0 (19)	0.0 (14)	4.8 (21)	0.0 (21)	0.0 (21)	0.0 (21)
Upper Choptank River	0.0 (9)	10.0 (10)	0.0 (10)	0.0 (9)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)
Total	14.7 (624)	10.0 (613)	6.0 (629)	9.8 (610)	4.7 (552)	11.5 (628)	6.7 (638)	6.6 (636)	4.6 (631)

[a] Data from the files of MBHRL, Laurel, Maryland.

[b] Frequency occurrence of SAV averaged over years, when multiplied by the extent of shoal habitat (<2.44 m at mlw) in an area, determined the sequence of survey areas used above.

APPENDIX TABLE E-2. FREQUENCY OCCURRENCE OF EELGRASS IN MARYLAND WATERFOWL SURVEY AREAS DURING THE YEARS 1971-1979[a]

	Percent with vegetation, and sample size ( )								
Survey area [b]	1971	1972	1973	1974	1975	1976	1977	1978	1979
Manokin, Annemessex R.	36.8 (57)	32.7 (55)	10.7 (56)	26.5 (34)	17.3 (52)	8.8 (57)	17.9 (56)	7.3 (55)	0.0 (56)
Bloodsworth, South Marsh I.	22.5 (40)	15.9 (44)	2.2 (46)	9.3 (43)	7.0 (43)	0.0 (45)	2.2 (46)	0.0 (46)	0.0 (45)
Smith Island (Maryland)	29.4 (17)	45.5 (11)	0.0 (12)	11.8 (17)	17.6 (17)	5.9 (17)	17.6 (17)	5.9 (17)	5.9 (17)
Bayshore, Hooper Island	60.9 (23)	4.3 (23)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (23)
Honga River	26.7 (30)	16.7 (30)	0.0 (30)	0.0 (30)	3.4 (29)	3.4 (29)	0.0 (30)	0.0 (30)	0.0 (30)
Eastern Bay	7.1 (28)	20.8 (24)	0.0 (28)	0.0 (28)	3.7 (27)	0.0 (27)	0.0 (27)	0.0 (27)	0.0 (27)
Lower Choptank River	5.9 (51)	6.3 (48)	0.0 (47)	0.0 (49)	0.0 (47)	0.0 (46)	0.0 (49)	0.0 (49)	0.0 (47)
Fishing Bay	4.0 (25)	4.0 (25)	0.0 (25)	0.0 (25)	0.0 (24)	0.0 (25)	0.0 (25)	0.0 (25)	0.0 (24)
Little Choptank River	3.3 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (30)
Patuxent River	2.0 (50)	0.0 (45)	0.0 (50)	0.0 (50)	0.0 (47)	0.0 (49)	0.0 (49)	0.0 (50)	0.0 (48)
Total	10.4 (624)	7.3 (613)	1.1 (629)	2.5 (610)	3.1 (552)	1.1 (628)	2.2 (638)	0.8 (636)	0.2 (631)

[a] Data from the files of MBHRL, Laurel, Maryland.

[b] Frequency occurrence of SAV averaged over years, when multiplied by the extent of shoal habitat (<2.44 m at mlw) in an area, determined the sequence of survey areas used above.

APPENDIX TABLE E-3. FREQUENCY OCCURRENCE OF REDHEAD GRASS IN MARYLAND WATERFOWL SURVEY AREAS DURING THE YEARS 1971-1979[a]

	Percent with vegetation, and sample size ( )								
Survey area[b]	1971	1972	1973	1974	1975	1976	1977	1978	1979
Chester River	44.4 (36)	33.3 (36)	26.5 (34)	14.7 (34)	16.7 (36)	17.1 (35)	8.3 (36)	19.4 (36)	13.9 (36)
Eastern Bay	10.7 (28)	12.5 (24)	10.7 (28)	14.3 (28)	11.1 (27)	11.1 (27)	3.7 (27)	7.4 (27)	11.1 (27)
Magothy - Severn Rivers	37.0 (27)	7.4 (27)	18.5 (27)	18.5 (27)	. (0)	12.0 (25)	7.4 (27)	14.8 (27)	14.8 (27)
Lower Choptank River	3.9 (51)	4.2 (48)	12.8 (47)	8.2 (49)	2.1 (47)	4.3 (46)	0.0 (49)	0.0 (49)	2.1 (47)
Patapsco R., Aberdeen P.G.	0.0 (52)	2.0 (50)	2.0 (50)	1.9 (52)	0.0 (22)	0.0 (52)	5.8 (52)	3.8 (52)	1.9 (52)
Wye River	9.1 (11)	0.0 (11)	18.2 (11)	18.2 (11)	0.0 (11)	0.0 (11)	0.0 (11)	0.0 (11)	0.0 (11)
Upper Choptank River	11.1 (9)	10.0 (10)	0.0 (10)	0.0 (9)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)
Total	5.3 (624)	3.4 (613)	4.1 (629)	3.4 (610)	1.8 (552)	2.2 (628)	1.4 (638)	2.4 (636)	2.2 (631)

[a] Data from the files of MBHRL, Laurel, Maryland.

[b] Frequency occurrence of SAV averaged over years, when multiplied by the extent of shoal habitat (<2.44 m at mlw) in an area, determined the sequence of survey areas used above.

APPENDIX TABLE E-4. FREQUENCY OCCURRENCE OF SAGO PONDWEED IN MARYLAND WATERFOWL SURVEY AREAS DURING THE YEARS 1971-1979[a]

Survey area[b]	Percent with vegetation, and sample size ( )								
	1971	1972	1973	1974	1975	1976	1977	1978	1979
Chester River	5.6 (36)	2.8 (36)	5.9 (34)	14.7 (34)	0.0 (36)	5.7 (35)	11.1 (36)	13.9 (36)	5.6 (36)
Eastern Bay	0.0 (28)	16.7 (24)	10.7 (28)	3.6 (28)	0.0 (27)	3.7 (27)	3.7 (27)	0.0 (27)	0.0 (27)
Magothy - Severn Rivers	7.4 (27)	7.4 (27)	11.1 (27)	7.4 (27)	. (0)	0.0 (25)	14.8 (27)	14.8 (27)	3.7 (27)
Manokin, Annemessex R.	1.8 (57)	12.7 (55)	1.8 (56)	0.0 (34)	0.0 (52)	0.0 (57)	0.0 (56)	0.0 (55)	0.0 (56)
Lower Choptank River	2.0 (51)	4.2 (48)	8.5 (47)	0.0 (49)	0.0 (47)	0.0 (46)	0.0 (49)	0.0 (49)	0.0 (47)
Bloodsworth, South Marsh I.	2.5 (40)	6.8 (44)	6.5 (46)	0.0 (43)	0.0 (43)	0.0 (45)	0.0 (46)	0.0 (46)	0.0 (45)
Bayshore, Hooper Island	0.0 (23)	30.4 (23)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (23)
Smith Island (Maryland)	0.0 (17)	27.3 (11)	8.3 (12)	0.0 (17)	0.0 (17)	0.0 (17)	0.0 (17)	0.0 (17)	0.0 (17)
Honga River	0.0 (30)	10.0 (30)	3.3 (30)	0.0 (30)	0.0 (29)	0.0 (29)	0.0 (30)	0.0 (30)	0.0 (30)
Little Choptank River	3.3 (30)	6.7 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (30)
Patapsco R., Aberdeen P.G.	0.0 (52)	2.0 (50)	0.0 (50)	0.0 (52)	0.0 (22)	0.0 (52)	0.0 (52)	0.0 (52)	0.0 (52)
Total	1.3 (624)	5.7 (613)	2.9 (629)	1.3 (610)	0.0 (552)	0.5 (628)	1.4 (638)	1.4 (636)	0.5 (631)

[a] Data from the files of MBHRL, Laurel, Maryland.

[b] Frequency occurrence of SAV averaged over years, when multiplied by the extent of shoal habitat (<2.44 m at mlw) in an area, determined the sequence of survey areas used above.

APPENDIX TABLE E-5. FREQUENCY OCCURRENCE OF EURASIAN WATERMILFOIL IN MARYLAND WATERFOWL SURVEY AREAS DURING THE YEARS 1971-79[a]

	Percent with vegetation, and sample size ( )								
Survey area[b]	1971	1972	1973	1974	1975	1976	1977	1978	1979
Susquehanna Flats	27.3 (22)	0.0 (30)	0.0 (30)	16.7 (30)	13.3 (30)	10.3 (29)	6.7 (30)	3.4 (29)	6.9 (29)
Chester River	33.3 (36)	11.1 (36)	2.9 (34)	0.0 (34)	0.0 (36)	0.0 (35)	2.8 (36)	2.8 (36)	16.7 (36)
Patapsco R., Aberdeen P.G.	5.8 (52)	2.0 (50)	2.0 (50)	0.0 (52)	0.0 (22)	1.9 (52)	3.8 (52)	0.0 (52)	3.8 (52)
Eastern Bay	0.0 (28)	4.2 (24)	3.6 (28)	3.6 (28)	0.0 (27)	3.7 (27)	3.7 (27)	7.4 (27)	11.1 (27)
Bayshore, Kent County	16.7 (12)	0.0 (6)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)
Magothy - Severn Rivers	0.0 (27)	3.7 (27)	0.0 (27)	0.0 (27)	. (0)	4.0 (25)	0.0 (27)	0.0 (27)	0.0 (27)
Sassafras River	10.0 (10)	0.0 (10)	0.0 (10)	10.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)
Northeast, Elk, Bohemia R.	0.0 (20)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (22)	0.0 (22)	0.0 (23)	0.0 (22)	4.3 (23)
Patuxent River	0.0 (50)	0.0 (45)	0.0 (50)	0.0 (50)	0.0 (47)	0.0 (49)	0.0 (49)	0.0 (50)	2.1 (48)
Total	3.8 (624)	1.1 (613)	0.5 (629)	1.1 (610)	0.7 (552)	1.0 (628)	0.9 (638)	0.6 (636)	2.4 (631)

[a] Data from the files of MBHRL, Laurel, Maryland.

[b] Frequency occurrence of SAV averaged over years, when multiplied by the extent of shoal habitat (<2.44 m at mlw) in an area, determined the sequence of survey areas used above.

APPENDIX TABLE E-6. FREQUENCY OCCURRENCE OF HORNED PONDWEED IN MARYLAND WATERFOWL SURVEY AREAS DURING THE YEARS 1971-1979[a]

	Percent with vegetation, and sample size ( )								
Survey area [b]	1971	1972	1973	1974	1975	1976	1977	1978	1979
Lower Choptank River	0.0 (51)	20.8 (48)	0.0 (47)	0.0 (49)	0.0 (47)	17.4 (46)	0.0 (49)	0.0 (49)	0.0 (47)
Chester River	0.0 (36)	0.0 (36)	2.9 (34)	0.0 (34)	0.0 (36)	5.7 (35)	19.4 (36)	19.4 (36)	0.0 (36)
Eastern Bay	0.0 (28)	8.3 (24)	0.0 (28)	0.0 (28)	0.0 (27)	14.8 (27)	3.7 (27)	0.0 (27)	3.7 (27)
Wye River	0.0 (11)	27.3 (11)	0.0 (11)	0.0 (11)	0.0 (11)	36.4 (11)	0.0 (11)	9.1 (11)	0.0 (11)
Magothy - Severn Rivers	0.0 (27)	0.0 (27)	0.0 (27)	3.7 (27)	. (0)	4.0 (25)	3.7 (27)	3.7 (27)	3.7 (27)
Miles River	0.0 (8)	12.5 (8)	0.0 (8)	0.0 (8)	0.0 (8)	14.3 (7)	0.0 (8)	0.0 (8)	0.0 (8)
Little Choptank River	0.0 (30)	3.3 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (30)	3.3 (30)	0.0 (30)	0.0 (30)
Patuxent River	0.0 (50)	0.0 (45)	0.0 (50)	0.0 (50)	0.0 (47)	0.0 (49)	2.0 (49)	2.0 (50)	0.0 (48)
Bayshore, Hooper Island	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (23)	4.3 (23)	0.0 (23)	0.0 (23)	0.0 (23)
Honga River	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (29)	3.4 (29)	0.0 (30)	0.0 (30)	0.0 (30)
South River, Herring Bay	0.0 (21)	0.0 (21)	0.0 (21)	0.0 (19)	0.0 (14)	0.0 (21)	0.0 (21)	0.0 (21)	4.8 (21)
Total	0.0 (624)	2.8 (613)	0.2 (629)	0.2 (610)	0.0 (552)	3.5 (628)	1.7 (638)	1.6 (636)	0.5 (631)

[a] Data from the files of MBHRL, Laurel, Maryland.

[b] Frequency occurrence of SAV averaged over years, when multiplied by the extent of shoal habitat (<2.44 m at mlw) in an area, determined the sequence of survey areas used above.

APPENDIX TABLE E-7. FREQUENCY OCCURRENCE OF WILDCELERY IN MARYLAND WATERFOWL SURVEY AREAS DURING THE YEARS 1971-1979[a]

	Percent with vegetation, and sample size ( )								
Survey area[b]	1971	1972	1973	1974	1975	1976	1977	1978	1979
Patapsco R., Aberdeen P.G.	0.0 (52)	0.0 (50)	2.0 (50)	5.8 (52)	9.1 (22)	3.8 (52)	3.8 (52)	3.8 (52)	5.8 (52)
Susquehanna Flats	45.5 (22)	3.3 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (29)	0.0 (30)	0.0 (29)	0.0 (29)
Chester River	2.8 (36)	0.0 (36)	2.9 (34)	5.9 (34)	8.3 (36)	2.9 (35)	5.6 (36)	2.8 (36)	2.8 (36)
Magothy - Severn Rivers	7.4 (27)	0.0 (27)	3.7 (27)	0.0 (27)	. (0)	4.0 (25)	0.0 (27)	0.0 (27)	7.4 (27)
Sassafras River	20.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)
Northeast, Elk, Bohemia R.	5.0 (20)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (22)	0.0 (22)	0.0 (23)	0.0 (22)	0.0 (23)
Bayshore, Kent County	8.3 (12)	0.0 (6)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)
Total	2.7 (624)	0.2 (613)	0.5 (629)	0.8 (610)	0.9 (552)	0.6 (628)	0.6 (638)	0.5 (636)	1.0 (631)

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[a] Data from the files of MBHRL, Laurel, Maryland.

[b] Frequency occurrence of SAV averaged over years, when multiplied by the extent of shoal habitat (<2.44 m at mlw) in an area, determined the sequence of survey areas used above.

APPENDIX TABLE F-1. MARYLAND WHISTLING SWAN POPULATIONS, DENSITIES, AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 16 YEAR PERIOD 1956-71

Survey area	Number			Density[a]			Percent			
	Mean	S.E.	C.V.	Mean	S.E.	Slope[b]	Mean	S.E.	C.V.	Slope
Lower Choptank River	7415.8	806.7	43.5	563.5	61.3	27.2	21.9	1.4	25.8	
Chester River	5055.4	570.4	45.1	648.9	73.2	32.2	15.3	1.0	26.4	
Eastern Bay	4988.4	615.4	49.4	627.2	77.4	44.9	14.4	1.2	33.2	0.6
Little Choptank River	2460.1	387.4	63.0	327.4	51.5		7.6	1.0	53.6	
Miles River	1880.3	189.8	40.4	870.9	87.9	44.1	5.7	0.5	32.3	
South River - Herring Bay	1267.3	169.8	53.6	282.6	37.9		4.1	0.6	57.1	
Bayshore, Hooper Island	990.6	163.5	66.0	174.9	28.9		2.9	0.4	59.1	
Susquehanna Flats	767.5	204.8	106.7	95.0	25.4		2.8	1.0	144.7	
Upper Choptank River	863.7	122.8	56.9	416.6	59.2		2.8	0.5	66.5	
Wye River	843.8	131.9	62.5	475.4	74.3		2.6	0.4	66.5	
Patapsco River - Aberdeen P.G.	618.6	166.0	107.3	35.9	9.6		2.2	0.6	114.4	
Magothy - Severn Rivers	720.6	181.5	100.8	160.1	40.3	17.1	2.2	0.5	87.2	
Patuxent River	723.5	147.1	81.3	95.6	19.4		2.1	0.4	66.6	
Bayshore, Kent Island	400.6	101.8	101.7	180.9	46.0		1.4	0.3	98.2	
Honga River	336.2	102.6	122.0	48.8	14.9		1.2	0.5	170.4	
Bayshore, Kent County	221.5	48.8	88.2	90.6	20.0	10.9	0.7	0.1	88.3	
Bloodsworth - South Marsh Islands	145.3	37.7	103.6	12.7	3.3		0.5	0.1	103.0	
Sassafras River	127.2	33.3	104.7	77.2	20.2		0.4	0.1	100.5	
Bayshore, Calvert County	105.0	32.1	122.2	38.1	11.6	6.3	0.3	0.1	118.9	
Northeast - Elk - Bohemia Rivers	59.4	20.3	136.5	13.1	4.5		0.2	0.1	148.4	
Nanticoke - Wicomico Rivers	49.4	14.7	119.4	6.7	2.0		0.2	0.0	117.0	
Manokin, Big - Little Annemessex R.	57.8	56.2	388.6	4.2	4.1		0.2	0.2	389.8	
Smith Island	87.5	49.1	224.2	20.5	11.5		0.2	0.1	225.9	
Fishing Bay	12.6	8.5	270.2	2.0	1.4		0.0	0.0	267.8	

[a] Densities are expressed in terms of birds per 1000 ha of shoal water habitat (<2.44 m at mlw).

[b] Area populations (density and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE F-2. MARYLAND CANADA GOOSE POPULATIONS, DENSITIES, AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 16 YEAR PERIOD 1956-71

	Number			Density[a]			Percent			
Survey area	Mean	S.E.	C.V.	Mean	S.E.	Slope[b]	Mean	S.E.	C.V.	Slope
Chester River	65490.6	7912.0	48.3	8405.9	1015.5	768.6	25.3	1.2	18.4	
Lower Choptank River	35713.5	5360.4	60.0	2714.0	407.4	278.6	12.7	0.9	27.5	
Sassafras River	23831.2	2632.0	44.2	14460.7	1597.1	878.2	10.0	0.9	37.2	
Wye River	16933.6	3450.0	81.5	9540.1	1943.7		6.5	1.1	65.2	
Eastern Bay	19008.5	4370.7	92.0	2390.1	549.6	323.6	6.3	1.0	63.5	0.4
Bayshore, Kent County	15677.9	3077.7	78.5	6414.8	1259.3	726.2	5.8	0.9	59.6	
Miles River	12671.6	2885.7	91.1	5869.2	1336.6	790.3	4.2	0.7	67.9	0.3
Upper Choptank River	8481.8	1415.9	66.8	4091.6	683.0	506.7	3.0	0.4	50.2	
Bayshore, Hooper Island	5151.9	795.9	61.8	909.4	140.5		2.0	0.4	76.7	
Northeast - Elk - Bohemia Rivers	6025.0	1498.0	99.5	1330.6	330.8	243.5	1.8	0.3	75.7	0.2
Honga River	4813.2	932.7	77.5	698.0	135.3	58.8	1.7	0.3	63.0	
Nanticoke - Wicomico Rivers	4224.1	1362.0	129.0	573.5	184.9		1.5	0.4	114.7	
Little Choptank River	3872.6	982.7	101.5	515.3	130.8	70.5	1.4	0.2	67.0	
Bayshore, Kent Island	2419.8	972.6	160.8	1093.0	439.3		1.3	0.5	142.4	
Bloodsworth - South Marsh Islands	2990.3	709.7	94.9	261.3	62.0		1.2	0.2	85.6	
Smith Island	2590.6	660.0	101.9	607.4	154.8		1.1	0.3	126.3	
Manokin, Big - Little Annemessex R.	2084.4	526.0	100.9	150.9	38.1	24.5	0.7	0.1	64.1	
Susquehanna Flats	1207.8	279.9	92.7	149.5	34.7		0.6	0.2	139.5	
Fishing Bay	1111.2	386.5	139.1	177.9	61.9		0.5	0.2	136.4	
Patapsco River - Aberdeen P.G.	567.8	310.1	218.4	33.0	18.0		0.4	0.3	244.8	
Patuxent River	1375.9	446.3	129.8	181.9	59.0	33.0	0.4	0.1	133.6	0.1
Magothy - Severn Rivers	310.9	125.7	161.8	69.1	27.9	16.4	0.1	0.0	142.5	
South River - Herring Bay	69.6	34.9	200.8	15.5	7.8	3.4	0.0	0.0	196.0	
Bayshore, Calvert County	1.6	1.6	400.0	0.6	0.6		0.0	0.0	400.0	

[a] Densities are expressed in terms of birds per 1000 ha of shoal water habitat (<2.44 m at mlw).

[b] Area populations (density and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE F-3. MARYLAND RUDDY DUCK POPULATIONS, DENSITIES, AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 16 YEAR PERIOD 1956-71

Survey area	Number			Density[a]			Percent			
	Mean	S.E.	C.V.	Mean	S.E.	Slope[b]	Mean	S.E.	C.V.	Slope
Patapsco River - Aberdeen P.G.	4111.9	1982.1	192.8	238.7	115.1		13.2	5.1	151.5	
Patuxent River	856.9	515.5	240.6	113.3	68.1		6.4	3.6	217.1	
Bayshore, Calvert County	410.6	222.9	217.1	148.9	80.8		3.6	1.9	208.1	
Lower Choptank River	346.1	164.7	190.3	26.3	12.5		3.4	1.8	201.9	
South River - Herring Bay	492.8	216.2	175.5	109.9	48.2		2.1	0.8	150.6	
Fishing Bay	231.4	113.5	196.3	37.0	18.2		2.1	1.2	216.5	
Susquehanna Flats	412.5	277.9	269.5	51.1	34.4		1.5	0.9	240.3	
Nanticoke - Wicomico Rivers	244.8	204.7	334.5	33.2	27.8		1.4	1.0	282.7	
Chester River	310.1	176.6	227.8	39.8	22.7		1.3	0.6	187.9	
Magothy - Severn Rivers	185.3	93.7	202.2	41.2	20.8		1.3	1.0	281.4	
Wye River	105.0	47.5	180.8	59.2	26.7	-12.6	1.2	0.7	214.7	
Manokin, Big - Little Annemessex R.	154.1	93.5	242.7	11.2	6.8	-3.3	0.9	0.5	205.4	
Eastern Bay	141.2	86.6	245.1	17.8	10.9	-5.3	0.7	0.4	217.8	
Upper Choptank River	111.9	48.6	173.6	54.0	23.4		0.6	0.3	180.5	
Bloodsworth - South Marsh Islands	25.0	19.4	309.8	2.2	1.7		0.2	0.2	270.0	
Sassafras River	25.0	25.0	400.0	15.2	15.2		0.1	0.1	387.3	
Miles River	29.7	15.7	211.3	13.8	7.3	-3.6	0.1	0.1	198.5	
Little Choptank River	10.9	6.4	235.6	1.5	0.9		0.1	0.1	203.7	
Northeast - Elk - Bohemia Rivers	1.6	1.6	400.0	0.3	0.3		0.0	0.0	387.3	
Bayshore, Kent County	10.0	6.5	261.4	4.1	2.7		0.0	0.0	216.8	
Bayshore, Kent Island	5.6	5.6	400.0	2.5	2.5		0.0	0.0	387.3	
Bayshore, Hooper Island	21.9	15.1	276.4	3.9	2.7		0.0	0.0	275.9	
Honga River	0.8	0.8	400.0	0.1	0.1		0.0	0.0	387.3	

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[a] Densities are expressed in terms of birds per 1000 ha of shoal water habitat (<2.44 m at mlw).

[b] Area populations (density and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE F-4. MARYLAND SCOTER POPULATIONS, DENSITIES, AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 16 YEAR PERIOD 1956-71

Survey area	Number			Density[a]			Percent			
	Mean	S.E.	C.V.	Mean	S.E.	Slope[b]	Mean	S.E.	C.V.	Slope
Bayshore, Calvert County	8707.5	7825.4	359.5	3157.2	2837.3		20.5	7.1	137.9	
Eastern Bay	1846.3	1396.2	302.5	232.1	175.6		12.5	6.3	201.6	
Lower Choptank River	537.8	233.2	173.4	40.9	17.7		8.5	3.2	150.2	
Smith Island	496.3	271.4	218.7	116.4	63.6		6.7	4.8	285.6	
Little Choptank River	411.8	185.8	180.5	54.8	24.7		6.1	2.5	166.2	
Bayshore, Kent Island	243.9	102.5	168.1	110.2	46.3		5.3	2.8	212.9	
Bayshore, Hooper Island	525.6	404.8	308.0	92.8	71.4		5.1	3.1	237.8	
South River - Herring Bay	463.1	381.2	329.3	103.3	85.0		3.7	3.1	337.1	
Patuxent River	493.8	266.1	215.5	65.3	35.2	-16.1	2.9	1.3	185.2	-0.7
Manokin, Big - Little Annemessex R.	171.9	76.3	177.6	12.4	5.5		1.5	0.7	183.6	
Chester River	98.9	45.6	184.3	12.7	5.9	-2.5	1.2	0.6	193.3	
Miles River	99.1	60.4	243.6	45.9	28.0		1.1	0.7	260.8	
Bloodsworth - South Marsh Islands	178.6	102.6	229.7	15.6	9.0		0.9	0.5	246.6	
Magothy - Severn Rivers	187.5	187.5	400.0	41.6	41.6		0.8	0.8	400.0	
Nanticoke - Wicomico Rivers	18.4	9.1	198.5	2.5	1.2		0.5	0.3	268.6	
Northeast - Elk - Bohemia Rivers	18.8	18.8	400.0	4.1	4.1		0.1	0.1	400.0	
Upper Choptank River	7.8	6.3	324.6	3.8	3.1		0.1	0.0	283.1	
Honga River	14.1	12.5	355.4	2.0	1.8		0.1	0.1	394.4	
Fishing Bay	1.9	1.6	335.5	0.3	0.3		0.1	0.1	375.6	
Patapsco River - Aberdeen P.G.	0.8	0.8	400.0	0.0	0.0		0.0	0.0	400.0	
Susquehanna Flats	1.6	1.6	400.0	0.2	0.2		0.0	0.0	400.0	
Bayshore, Kent County	0.8	0.8	400.0	0.3	0.3		0.0	0.0	400.0	

[a] Densities are expressed in terms of birds per 1000 ha of shoal water habitat (<2.44 m at mlw).

[b] Area populations (density and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE F-5. MARYLAND BUFFLEHEAD POPULATIONS, DENSITIES, AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 16 YEAR PERIOD 1956-71

Survey area	Number			Density[a]			Percent			
	Mean	S.E.	C.V.	Mean	S.E.	Slope[b]	Mean	S.E.	C.V.	Slope
Lower Choptank River	754.1	197.7	104.8	57.3	15.0	9.4	8.9	2.1	95.6	1.0
Eastern Bay	710.0	179.4	101.1	89.3	22.6	17.0	7.7	1.6	83.3	1.1
Chester River	608.9	219.2	144.0	78.2	28.1		6.9	2.1	120.9	
Manokin, Big - Little Annemessex R.	258.7	57.4	88.8	18.7	4.2		6.4	2.1	132.6	-1.1
Little Choptank River	341.3	59.0	69.2	45.4	7.9		6.3	1.5	93.5	
Miles River	306.9	83.2	108.5	142.1	38.6		4.7	1.4	121.6	
South River - Herring Bay	420.6	223.2	212.3	93.8	49.8		4.6	1.8	161.3	
Patuxent River	316.4	110.9	140.2	41.8	14.7		4.4	1.6	146.7	
Susquehanna Flats	110.3	52.8	191.5	13.7	6.5		4.3	2.7	247.3	
Bayshore, Calvert County	232.8	80.2	137.8	84.4	29.1		4.0	1.6	159.6	
Patapsco River - Aberdeen P.G.	85.2	46.1	216.4	4.9	2.7		2.5	2.0	325.6	
Honga River	205.6	67.2	130.7	29.8	9.7	4.2	2.4	0.6	105.6	
Bloodsworth - South Marsh Islands	175.4	123.5	281.5	15.3	10.8		2.0	0.8	167.0	
Magothy - Severn Rivers	97.8	28.4	116.3	21.7	6.3	2.7	1.7	0.7	156.9	
Fishing Bay	90.5	26.6	117.7	14.5	4.3		1.7	0.7	172.3	
Wye River	109.1	56.3	206.3	61.5	31.7		1.6	0.7	173.2	
Smith Island	90.1	47.5	210.7	21.1	11.1		1.6	1.0	239.2	
Nanticoke - Wicomico Rivers	102.5	42.5	165.9	13.9	5.8		1.5	0.5	132.9	
Bayshore, Kent Island	67.2	23.7	141.0	30.3	10.7		1.0	0.4	166.1	
Upper Choptank River	54.7	21.8	159.4	26.4	10.5		0.8	0.3	151.1	
Bayshore, Hooper Island	46.1	25.1	218.1	8.1	4.4		0.6	0.2	156.3	
Northeast - Elk - Bohemia Rivers	31.2	25.4	324.6	6.9	5.6		0.4	0.4	368.6	
Bayshore, Kent County	28.1	19.2	273.3	11.5	7.9		0.2	0.1	235.1	
Sassafras River	1.6	1.6	383.9	1.0	0.9		0.0	0.0	345.9	

[a] Densities are expressed in terms of birds per 1000 ha of shoal water habitat (<2.44 m at mlw).

[b] Area populations (density and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE F-6. MARYLAND COMMON GOLDENEYE POPULATIONS, DENSITIES, AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 16 YEAR PERIOD 1956-71

Survey area	Number			Density[a]			Percent			
	Mean	S.E.	C.V.	Mean	S.E.	Slope[b]	Mean	S.E.	C.V.	Slope
Lower Choptank River	4086.5	725.2	71.0	310.5	55.1		19.2	2.9	60.8	
Eastern Bay	2961.9	541.1	73.1	372.4	68.0		14.0	1.7	48.6	
Little Choptank River	1447.8	238.0	65.8	192.7	31.7		7.3	0.9	51.9	
Chester River	1583.5	401.4	101.4	203.2	51.5		7.2	1.4	78.2	
Bayshore, Kent Island	1052.0	239.7	91.1	475.2	108.3		5.4	1.1	82.0	
Miles River	1015.9	223.6	88.0	470.5	103.6		4.5	0.9	78.3	
South River - Herring Bay	541.9	263.1	194.2	120.8	58.7		3.2	1.9	238.5	
Honga River	667.2	143.0	85.8	96.7	20.7		3.2	0.6	74.5	
Bayshore, Calvert County	348.4	115.5	132.6	126.3	41.9	21.9	2.8	1.4	198.8	0.6
Susquehanna Flats	324.7	133.4	164.3	40.2	16.5		2.5	1.3	203.3	
Bayshore, Hooper Island	483.9	103.5	85.5	85.4	18.3		2.3	0.5	82.3	
Fishing Bay	409.8	65.3	63.7	65.6	10.4		2.3	0.4	63.9	
Manokin, Big - Little Annemessex R.	453.1	120.8	106.6	32.8	8.7		2.2	0.5	88.6	
Wye River	460.9	107.5	93.3	259.7	60.6		2.1	0.5	101.1	
Nanticoke - Wicomico Rivers	366.9	116.8	127.4	49.8	15.9		2.0	0.5	107.8	
Patuxent River	436.6	150.0	137.4	57.7	19.8		1.8	0.5	109.7	-0.3
Upper Choptank River	252.6	72.4	114.6	121.9	34.9		1.3	0.3	106.6	
Bloodsworth - South Marsh Islands	295.9	110.6	149.6	25.8	9.7		1.3	0.5	161.5	
Magothy - Severn Rivers	204.4	77.7	152.1	45.4	17.3		1.2	0.4	127.3	
Bayshore, Kent County	150.6	32.9	87.4	61.6	13.5		1.1	0.4	150.4	
Northeast - Elk - Bohemia Rivers	100.6	40.3	160.2	22.2	8.9		0.6	0.2	162.9	
Patapsco River - Aberdeen P.G.	63.8	24.0	150.6	3.7	1.4		0.3	0.1	125.0	
Smith Island	81.2	40.0	197.0	19.0	9.4		0.3	0.1	184.6	
Sassafras River	40.8	31.3	307.0	24.7	19.0		0.2	0.2	315.7	

[a] Densities are expressed in terms of birds per 1000 ha of shoal water habitat (<2.44 m at mlw).

[b] Area populations (density and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE F-7. MARYLAND CANVASBACK POPULATIONS, DENSITIES, AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 16 YEAR PERIOD 1956-71

Survey area	Number			Density[a]			Percent			
	Mean	S.E.	C.V.	Mean	S.E.	Slope[b]	Mean	S.E.	C.V.	Slope
Lower Choptank River	7229.9	1237.4	68.5	549.4	94.0		8.4	1.2	57.8	
Bayshore, Calvert County	6655.6	2901.4	174.4	2413.2	1052.0		7.9	3.1	157.1	
Patuxent River	6043.4	1953.1	129.3	798.8	258.1		6.5	1.9	116.9	
South River - Herring Bay	4134.8	789.2	76.4	922.1	176.0		5.5	1.3	96.4	
Nanticoke - Wicomico Rivers	3662.8	1835.2	200.4	497.3	249.1		3.7	1.7	179.8	
Chester River	3127.6	832.2	106.4	401.4	106.8		3.6	1.0	107.5	
Eastern Bay	2711.2	613.4	90.5	340.9	77.1		3.4	0.9	102.4	
Little Choptank River	2892.5	853.4	118.0	384.9	113.6		3.2	0.9	107.8	
Bayshore, Kent Island	4473.1	4041.7	361.4	2020.4	1825.5		3.0	2.3	312.6	
Bayshore, Kent County	2450.6	1183.4	193.2	1002.7	484.2		2.7	1.1	161.0	
Patapsco River - Aberdeen P.G.	1595.1	847.5	212.5	92.6	49.2		2.4	1.5	246.0	
Magothy - Severn Rivers	2444.1	892.3	146.0	542.9	198.2		2.4	0.7	121.6	
Wye River	2055.3	716.9	139.5	1157.9	403.9		2.2	0.7	128.2	
Fishing Bay	1315.5	586.8	178.4	210.6	93.9		1.6	0.8	195.7	
Miles River	980.1	314.3	128.3	453.9	145.6		1.2	0.4	120.3	
Upper Choptank River	522.5	166.4	127.4	252.0	80.3	-33.7	0.6	0.2	122.1	
Manokin, Big - Little Annemessex R.	447.0	187.1	167.4	32.4	13.5		0.6	0.3	212.7	
Honga River	287.5	143.9	200.3	41.7	20.9		0.4	0.2	233.7	
Susquehanna Flats	295.3	170.0	230.3	36.6	21.1		0.3	0.2	223.4	
Sassafras River	178.1	123.5	277.3	108.1	74.9		0.3	0.2	321.9	
Bayshore, Hooper Island	253.1	170.4	269.2	44.7	30.1		0.3	0.2	226.5	
Bloodsworth - South Marsh Islands	193.8	174.8	360.8	16.9	15.3		0.2	0.2	375.8	
Smith Island	78.1	37.4	191.2	18.3	8.8		0.1	0.0	192.8	
Northeast - Elk - Bohemia Rivers	16.4	12.4	303.7	3.6	2.7		0.0	0.0	288.9	

[a] Densities are expressed in terms of birds per 1000 ha of shoal water habitat (<2.44 m at mlw).

[b] Area populations (density and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE F-8. MARYLAND SCAUP POPULATIONS, DENSITIES, AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 16 YEAR PERIOD 1956-71

Survey area	Number			Density[a]			Percent			
	Mean	S.E.	C.V.	Mean	S.E.	Slope[b]	Mean	S.E.	C.V.	Slope
Patuxent River	5640.6	2387.0	169.3	745.5	315.5		9.7	3.5	143.4	
Bayshore, Calvert County	3212.5	1319.9	164.4	1164.8	478.6		6.4	2.9	180.7	
Bayshore, Kent Island	993.8	654.4	263.4	448.8	295.6		6.3	5.2	330.3	
South River - Herring Bay	1620.0	808.2	199.6	361.3	180.2		4.8	2.9	241.6	
Magothy - Severn Rivers	671.6	368.1	219.2	149.2	81.8		3.4	2.4	281.5	
Honga River	1112.5	804.4	289.2	161.3	116.6		2.8	2.3	328.6	
Lower Choptank River	843.4	258.0	122.4	64.1	19.6		1.9	0.7	146.5	
Fishing Bay	865.6	521.4	240.9	138.6	83.5		1.9	1.2	254.0	
Patapsco River - Aberdeen P.G.	899.1	326.2	145.1	52.2	18.9		1.7	0.6	135.8	
Bayshore, Kent County	395.9	195.6	197.6	162.0	80.0		1.7	1.0	232.1	
Manokin, Big - Little Annemessex R.	503.1	176.2	140.1	36.4	12.8		1.5	0.7	188.1	
Chester River	707.0	337.4	190.9	90.7	43.3		1.3	0.6	187.2	
Little Choptank River	673.4	406.1	241.2	89.6	54.0		1.2	0.5	181.8	
Nanticoke - Wicomico Rivers	443.8	194.5	175.3	60.2	26.4		1.1	0.5	181.5	
Bayshore, Hooper Island	326.6	324.9	398.0	57.6	57.4		1.0	1.0	397.5	
Eastern Bay	333.8	142.4	170.7	42.0	17.9		0.9	0.5	202.5	
Bloodsworth - South Marsh Islands	335.1	245.0	292.4	29.3	21.4		0.6	0.4	262.7	
Smith Island	289.1	261.4	361.8	67.8	61.3		0.5	0.5	358.7	
Wye River	263.4	166.5	252.7	148.4	93.8		0.4	0.2	214.5	
Upper Choptank River	245.3	185.6	302.6	118.3	89.5		0.4	0.3	269.0	
Miles River	73.4	46.8	254.9	34.0	21.7		0.2	0.1	291.8	
Susquehanna Flats	106.2	68.0	256.0	13.2	8.4		0.1	0.1	243.5	
Northeast - Elk - Bohemia Rivers	7.8	6.3	324.6	1.7	1.4		0.0	0.0	311.2	
Sassafras River	2.8	1.9	275.2	1.7	1.2		0.0	0.0	273.3	

[a] Densities are expressed in terms of birds per 1000 ha of shoal water habitat (<2.44 m at mlw).

[b] Area populations (density and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE F-9. MARYLAND REDHEAD POPULATIONS, DENSITIES, AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 16 YEAR PERIOD 1956-71

Survey area	Number			Density[a]			Percent			
	Mean	S.E.	C.V.	Mean	S.E.	Slope[b]	Mean	S.E.	C.V.	Slope
Lower Choptank River	5656.6	2486.7	175.8	429.9	189.0	-81.9	12.7	3.4	108.2	
Bayshore, Calvert County	3989.1	1974.3	198.0	1446.4	715.8		10.4	4.9	188.0	
Honga River	2984.4	1419.6	190.3	432.8	205.9		8.6	4.7	217.9	
Patuxent River	2106.6	1033.8	196.3	278.4	136.6		8.1	5.5	271.8	
Little Choptank River	2674.1	845.6	126.5	355.8	112.5		6.4	1.8	111.5	
Susquehanna Flats	1341.2	1318.7	393.3	166.1	163.3		4.5	4.4	395.2	
Eastern Bay	1712.5	917.6	214.3	215.3	115.4		3.5	1.2	138.8	
Chester River	802.8	408.9	203.7	103.0	52.5	-24.3	3.0	1.4	189.5	
Bayshore, Hooper Island	1034.4	445.8	172.4	182.6	78.7		2.8	1.5	216.3	
Sassafras River	89.1	64.2	288.3	54.0	38.9		2.5	2.4	389.7	
Magothy - Severn Rivers	726.6	425.7	234.4	161.4	94.6		2.3	1.7	290.6	
South River - Herring Bay	887.5	527.6	237.8	197.9	117.7		2.0	1.2	239.9	
Bayshore, Kent Island	1668.8	1557.2	373.3	753.7	703.3		1.7	1.3	311.3	
Fishing Bay	951.6	609.7	256.3	152.3	97.6		1.7	1.2	294.0	
Miles River	464.1	291.9	251.6	214.9	135.2		1.6	1.1	288.0	
Wye River	450.0	197.7	175.8	253.5	111.4		1.3	0.7	198.0	
Upper Choptank River	575.0	451.8	314.3	277.4	217.9		1.0	0.4	182.6	-0.2
Nanticoke - Wicomico Rivers	753.1	560.0	297.4	102.2	76.0		0.9	0.5	219.3	
Bayshore, Kent County	170.3	102.7	241.2	69.7	42.0		0.8	0.4	210.8	
Patapsco River - Aberdeen P.G.	151.2	101.0	267.2	8.8	5.9		0.4	0.2	258.5	
Bloodsworth - South Marsh Islands	181.2	156.6	345.6	15.8	13.7		0.3	0.3	373.2	
Smith Island	87.5	60.5	276.4	20.5	14.2		0.2	0.1	277.0	
Manokin, Big - Little Annemessex R.	12.5	12.5	400.0	0.9	0.9		0.0	0.0	400.0	

[a] Densities are expressed in terms of birds per 1000 ha of shoal water habitat (<2.44 m at mlw).

[b] Area populations (density and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE F-10. MARYLAND AMERICAN WIGEON POPULATIONS, DENSITIES, AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 16 YEAR PERIOD 1956-71

Survey area	Number			Density[a]			Percent			
	Mean	S.E.	C.V.	Mean	S.E.	Slope[b]	Mean	S.E.	C.V.	Slope
Eastern Bay	2338.5	737.4	126.1	294.0	92.7		13.3	2.7	81.1	
Lower Choptank River	2324.7	526.3	90.6	176.7	40.0	-17.6	13.1	1.4	41.7	
Chester River	2065.8	637.9	123.5	265.2	81.9	-40.4	12.3	3.2	104.5	-1.3
Honga River	532.3	218.7	164.4	77.2	31.7		6.6	4.7	285.6	
Bayshore, Hooper Island	524.6	170.8	130.2	92.6	30.1		6.0	2.3	152.0	1.0
Little Choptank River	605.4	177.1	117.0	80.6	23.6		4.0	1.2	115.7	
Smith Island	476.6	226.6	190.2	111.7	53.1		3.8	1.5	153.0	
Patapsco River - Aberdeen P.G.	483.4	359.4	297.4	28.1	20.9		2.9	1.7	231.6	
Wye River	865.4	620.4	286.8	487.5	349.5		2.7	1.5	218.4	-0.7
Bloodsworth - South Marsh Islands	345.3	110.4	127.9	30.2	9.6		2.6	1.2	175.7	
Bayshore, Kent Island	210.8	179.8	341.3	95.2	81.2		1.8	1.6	353.5	
South River - Herring Bay	230.3	103.6	179.8	51.4	23.1		1.8	0.9	209.0	
Susquehanna Flats	226.2	109.6	193.7	28.0	13.6		1.6	0.9	221.2	
Manokin, Big - Little Annemessex R.	147.2	42.3	115.1	10.7	3.1		1.3	0.3	105.3	0.2
Patuxent River	141.9	46.3	130.6	18.8	6.1		1.0	0.4	154.6	
Miles River	142.6	67.4	189.0	66.0	31.2		0.9	0.5	197.7	
Magothy - Severn Rivers	71.6	34.5	193.1	15.9	7.7		0.8	0.5	253.0	
Nanticoke - Wicomico Rivers	99.4	49.8	200.5	13.5	6.8		0.7	0.3	181.2	
Sassafras River	148.4	68.6	185.0	90.1	41.6	-21.1	0.6	0.2	146.5	-0.1
Upper Choptank River	84.2	40.2	191.0	40.6	19.4		0.5	0.3	205.9	
Bayshore, Kent County	45.3	18.0	158.9	18.5	7.4		0.3	0.1	176.0	
Fishing Bay	62.2	28.4	182.9	10.0	4.6		0.3	0.1	163.3	
Northeast - Elk - Bohemia Rivers	16.9	12.6	298.6	3.7	2.8		0.1	0.0	235.1	

[a] Densities are expressed in terms of birds per 1000 ha of shoal water habitat (<2.44 m at mlw).

[b] Area populations (density and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE F-11. MARYLAND BLACK DUCK POPULATIONS, DENSITIES, AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 16 YEAR PERIOD 1956-71

	Number			Density[a]			Percent			
Survey area	Mean	S.E.	C.V.	Mean	S.E.	Slope[b]	Mean	S.E.	C.V.	Slope
Chester River	17466.2	3266.0	74.8	2241.8	419.2	-208.1	23.6	2.2	36.8	-0.9
Eastern Bay	7666.8	1541.9	80.4	964.0	193.9		11.5	2.0	71.3	
Lower Choptank River	6405.0	854.3	53.4	486.7	64.9		9.7	1.2	51.2	
Wye River	3124.2	763.8	97.8	1760.1	430.3		4.4	0.9	80.2	
Sassafras River	2147.0	922.9	172.0	1302.8	560.0		3.3	1.5	178.7	
Honga River	2223.4	627.1	112.8	322.4	90.9		3.3	1.0	116.7	
Nanticoke - Wicomico Rivers	2072.9	357.5	69.0	281.4	48.5		3.2	0.5	64.9	0.2
Bayshore, Hooper Island	2057.4	491.2	95.5	363.2	86.7		3.0	0.6	77.0	
Miles River	1408.1	225.9	64.2	652.2	104.6		2.3	0.4	74.2	
Manokin, Big - Little Annemessex R.	1448.1	344.3	95.1	104.8	24.9		2.3	0.6	105.6	
Smith Island	1370.9	326.7	95.3	321.4	76.6		2.2	0.5	97.0	
Little Choptank River	1258.4	214.7	68.3	167.5	28.6		2.1	0.4	81.5	
Bloodsworth - South Marsh Islands	1558.4	442.3	113.5	136.2	38.6		2.1	0.6	111.6	
Bayshore, Kent Island	1135.4	420.8	148.2	512.8	190.0	-87.5	1.9	0.8	157.1	-0.3
Fishing Bay	985.7	234.4	95.1	157.8	37.5		1.5	0.4	102.7	
Bayshore, Kent County	976.3	210.1	86.1	399.5	86.0		1.4	0.3	75.8	
Upper Choptank River	815.7	173.1	84.9	393.5	83.5	-36.6	1.2	0.2	66.7	
Patapsco River - Aberdeen P.G.	665.8	352.9	212.1	38.6	20.5		0.7	0.3	168.0	
Patuxent River	495.9	131.5	106.1	65.5	17.4		0.7	0.1	82.2	
Susquehanna Flats	372.5	128.9	138.4	46.1	16.0	-6.8	0.6	0.2	169.5	
Northeast - Elk - Bohemia Rivers	483.4	194.7	161.1	106.8	43.0		0.6	0.2	105.7	
South River - Herring Bay	222.4	57.0	102.4	49.6	12.7		0.4	0.1	103.4	
Magothy - Severn Rivers	164.0	50.2	122.4	36.4	11.1	4.9	0.3	0.1	127.5	
Bayshore, Calvert County	40.9	25.4	248.1	14.8	9.2		0.1	0.0	234.4	

[a] Densities are expressed in terms of birds per 1000 ha of shoal water habitat (<2.44 m at mlw).

[b] Area populations (density and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE F-12. MARYLAND MALLARD POPULATIONS, DENSITIES, AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 16 YEAR PERIOD 1956-71

Survey area	Number			Density[a]			Percent			
	Mean	S.E.	C.V.	Mean	S.E.	Slope[b]	Mean	S.E.	C.V.	Slope
Chester River	14504.2	3247.9	89.6	1861.7	416.9		33.9	3.8	45.2	
Sassafras River	2777.9	1191.6	171.6	1685.6	723.0		7.7	2.4	123.4	
Eastern Bay	2184.1	605.0	110.8	274.6	76.1		6.3	1.6	104.6	
Lower Choptank River	1848.8	396.2	85.7	140.5	30.1		6.2	1.4	92.8	
Wye River	2139.8	899.8	168.2	1205.5	506.9		5.4	2.1	156.0	
Nanticoke - Wicomico Rivers	1351.4	437.2	129.4	183.5	59.3		4.5	1.6	146.0	0.8
Bayshore, Kent Island	554.3	231.2	166.8	250.4	104.4	-45.8	2.2	0.9	160.5	-0.4
Bayshore, Kent County	482.6	125.8	104.3	197.5	51.5		1.7	0.5	124.5	
Bayshore, Hooper Island	440.9	145.2	131.8	77.8	25.6		1.1	0.4	129.2	
Miles River	333.2	94.0	112.8	154.3	43.5	18.5	1.0	0.2	94.2	0.1
Honga River	441.6	215.9	195.6	64.0	31.3		0.9	0.4	191.3	
Smith Island	235.1	45.7	77.7	55.1	10.7		0.8	0.2	114.3	
Northeast - Elk - Bohemia Rivers	318.9	162.1	203.4	70.4	35.8		0.7	0.2	122.6	
Patuxent River	286.9	81.9	114.2	37.9	10.8		0.7	0.2	101.3	
Little Choptank River	208.8	41.9	80.3	27.8	5.6		0.7	0.2	103.6	
Bloodsworth - South Marsh Islands	240.3	73.1	121.7	21.0	6.4		0.7	0.3	159.5	
Upper Choptank River	163.4	38.1	93.3	78.8	18.4		0.6	0.2	104.4	
Patapsco River - Aberdeen P.G.	227.1	94.3	166.2	13.2	5.5		0.5	0.2	138.1	
Susquehanna Flats	122.8	40.3	131.3	15.2	5.0		0.5	0.2	170.4	
Magothy - Severn Rivers	128.1	55.5	173.2	28.5	12.3		0.5	0.2	178.0	
Manokin, Big - Little Annemessex R.	210.1	61.7	117.4	15.2	4.5		0.5	0.1	121.0	
South River - Herring Bay	89.1	51.4	230.8	19.9	11.5		0.2	0.1	181.2	
Fishing Bay	84.4	40.7	192.9	13.5	6.5		0.2	0.1	198.0	
Bayshore, Calvert County	12.5	12.5	400.0	4.5	4.5		0.0	0.0	400.0	

[a] Densities are expressed in terms of birds per 1000 ha of shoal water habitat (<2.44 m at mlw).

[b] Area populations (density and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE F-13. MARYLAND PINTAIL POPULATIONS, DENSITIES, AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 16 YEAR PERIOD 1956-71

Survey area	Number			Density[a]			Percent			
	Mean	S.E.	C.V.	Mean	S.E.	Slope[b]	Mean	S.E.	C.V.	Slope
Smith Island	2527.8	1223.0	193.5	592.7	286.7		17.9	5.7	126.4	
Chester River	3083.2	1196.8	155.3	395.7	153.6	-84.4	16.7	5.8	138.0	
Eastern Bay	1076.8	443.5	164.8	135.4	55.8		11.5	4.4	153.9	
Sassafras River	146.9	105.4	287.1	89.1	64.0		5.6	5.1	366.6	
Bayshore, Hooper Island	490.6	192.3	156.7	86.6	33.9		5.2	1.8	142.1	
Honga River	291.9	116.9	160.2	42.3	17.0		5.1	3.1	242.4	
Lower Choptank River	670.8	395.7	236.0	51.0	30.1	-14.1	4.9	2.4	196.0	
Bloodsworth - South Marsh Islands	730.3	279.4	153.1	63.8	24.4		4.6	1.7	145.4	
Manokin, Big - Little Annemessex R.	350.6	223.7	255.2	25.4	16.2		3.1	2.1	271.5	
Bayshore, Kent Island	222.8	113.5	203.8	100.6	51.3		2.8	1.3	180.3	
Bayshore, Kent County	301.6	220.7	292.7	123.4	90.3		2.5	1.8	285.0	
Nanticoke - Wicomico Rivers	159.4	121.9	305.9	21.6	16.5		1.5	1.2	319.8	
Little Choptank River	91.4	44.2	193.2	12.2	5.9		1.4	0.9	265.6	
Wye River	161.9	123.6	305.3	91.2	69.6		0.8	0.3	172.6	
Miles River	35.6	19.6	220.2	16.5	9.1		0.7	0.4	190.9	
Northeast - Elk - Bohemia Rivers	15.6	12.5	319.3	3.4	2.8		0.2	0.2	260.3	
Bayshore, Calvert County	14.1	12.5	355.4	5.1	4.5		0.2	0.1	277.4	
Upper Choptank River	15.6	10.9	279.4	7.5	5.3	-2.4	0.1	0.1	314.5	
Fishing Bay	40.9	21.9	213.7	6.6	3.5	-1.5	0.1	0.1	176.7	
Patapsco River - Aberdeen P.G.	1.1	1.1	400.0	0.1	0.1		0.0	0.0	400.0	
Patuxent River	7.8	6.3	324.6	1.0	0.8		0.0	0.0	338.5	

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[a] Densities are expressed in terms of birds per 1000 ha of shoal water habitat (<2.44 m at mlw).

[b] Area populations (density and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE G-1. VIRGINIA WHISTLING SWAN POPULATIONS AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 11 YEAR PERIOD 1961-71

	Number				Percent			
Survey area	Mean	S.E.	C.V.	Slope[a]	Mean	S.E.	C.V.	Slope
Smith Pt. to Windmill Pt.	87.7	63.9	241.7		2.4	1.4	181.5	0.9
Rappahannock River (Lower)	11.9	7.2	200.7		1.3	0.7	175.8	
Silver Beach to Saxis	5.9	5.9	331.7		0.5	0.5	316.2	
Rappahannock River (Upper)	0.5	0.5	331.7		0.5	0.5	316.2	
Mobjack Bay and Piankatank River	11.4	9.1	267.0		0.3	0.3	271.4	0.2
Newport News to York River	9.1	9.1	331.7		0.3	0.3	316.2	
Fisherman's Island to Silver Beach	4.1	2.8	224.2		0.2	0.2	248.5	
York River	2.3	2.3	331.7		0.0	0.0	316.2	
James River (Middle)	1.5	1.1	226.7		0.0	0.0	268.6	
James River (Hog Island Refuge)	0.5	0.5	331.7		0.0	0.0	316.2	

[a] Area populations (number and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE G-2. VIRGINIA CANADA GOOSE POPULATIONS AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 11 YEAR PERIOD 1961-71

Survey area	Number				Percent			
	Mean	S.E.	C.V.	Slope[a]	Mean	S.E.	C.V.	Slope
James River (Presquile NWR)	8972.3	869.7	32.1	580.8	22.0	2.4	35.5	
Pamunkey River	6144.1	558.7	30.2		15.2	1.7	37.1	-1.1
Fisherman's Island to Silver Beach	7835.5	4843.0	205.0		10.7	4.3	133.3	
James River (Hog Island Refuge)	3439.1	442.1	42.6		8.6	1.4	51.9	
Rappahannock River (Upper)	3311.4	888.1	88.9	764.3	7.6	2.0	87.0	1.6
James River (Upper)	1920.9	375.4	64.8		4.7	1.1	79.4	
Silver Beach to Saxis	895.9	280.3	103.8		2.1	0.7	116.0	
James River (Lower)	759.4	306.4	133.8		1.4	0.4	84.1	
Rappahannock River (Lower)	755.7	324.0	142.2		1.4	0.4	98.8	
James River (Middle)	345.9	150.9	144.6		0.8	0.4	160.0	
Smith Pt. to Windmill Pt.	560.5	435.6	257.8		0.7	0.3	167.3	
Mattaponi River	196.8	42.6	71.7	-26.5	0.6	0.1	89.1	
York River	85.0	30.1	117.5	20.9	0.2	0.0	97.7	
Mobjack Bay and Piankatank River	71.4	53.8	249.8		0.1	0.0	190.1	
Newport News to York River	11.8	9.2	258.9		0.0	0.0	285.0	
Chickahominy River	6.4	5.4	283.5		0.0	0.0	297.9	

[a] Area populations (number and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE G-3. VIRGINIA RUDDY DUCK POPULATIONS AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 11 YEAR PERIOD 1961-71

	Number				Percent			
Survey area	Mean	S.E.	C.V.	Slope[a]	Mean	S.E.	C.V.	Slope
Rappahannock River (Lower)	8348.6	1821.0	72.3		56.9	7.0	41.0	
York River	2640.9	1054.1	132.4		15.4	5.5	118.3	
Newport News to York River	1619.1	746.2	152.9		9.4	4.0	140.2	
James River (Lower)	1216.2	743.8	202.8		4.7	2.3	161.5	
James River (Middle)	633.2	406.3	212.8		3.3	2.1	211.1	
Rappahannock River (Upper)	338.2	287.2	281.7		2.4	1.3	172.6	
Mobjack Bay and Piankatank River	176.4	45.0	84.6		2.4	0.8	113.6	
Smith Pt. to Windmill Pt.	66.8	35.8	177.5		1.7	1.3	242.5	
James River (Hog Island Refuge)	11.4	9.1	267.0		0.5	0.5	323.1	
James River (Upper)	80.0	46.3	191.9		0.3	0.2	180.0	
Pamunkey River	4.5	4.5	331.7		0.2	0.2	331.7	
James River (Presquile NWR)	2.3	1.6	227.9		0.1	0.1	315.9	
Silver Beach to Saxis	4.1	4.1	331.7		0.0	0.0	331.7	

[a] Area populations (number and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE G-4. VIRGINIA SCOTER POPULATIONS AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 11 YEAR PERIOD 1961-71

Survey area	Number				Percent			
	Mean	S.E.	C.V.	Slope[a]	Mean	S.E.	C.V.	Slope
Fisherman's Island to Silver Beach	1250.0	764.0	202.7		23.4	12.5	168.9	
Newport News to York River	211.4	65.4	102.6		19.0	9.3	154.9	
Smith Pt. to Windmill Pt.	218.2	179.3	272.6		13.2	8.8	210.4	
Mobjack Bay and Piankatank River	90.0	49.5	182.3		11.5	7.0	193.5	
James River (Lower)	15.9	11.1	230.4		8.7	8.6	312.9	
Silver Beach to Saxis	72.7	72.7	331.7		2.6	2.6	316.2	
James River (Middle)	4.1	2.8	224.2		1.5	1.4	297.6	
James River (Upper)	0.9	0.9	331.7		0.0	0.0	316.2	

[a] Area populations (number and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE G-5. VIRGINIA BUFFLEHEAD POPULATIONS AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 11 YEAR PERIOD 1961-71

Survey area	Number				Percent			
	Mean	S.E.	C.V.	Slope[a]	Mean	S.E.	C.V.	Slope
Rappahannock River (Lower)	698.2	265.6	126.2		20.8	6.6	105.7	
Mobjack Bay and Piankatank River	370.5	120.8	108.2		20.1	5.6	93.0	
Newport News to York River	265.0	119.3	142.4		15.8	5.4	107.9	
York River	293.6	98.5	111.2		13.3	3.2	78.6	
Smith Pt. to Windmill Pt.	146.4	46.3	104.9		6.3	1.9	98.5	
James River (Lower)	69.5	23.9	114.3		6.0	3.0	169.8	
Fisherman's Island to Silver Beach	176.4	127.8	240.4		2.9	2.0	226.8	
Silver Beach to Saxis	117.7	80.5	226.7		2.3	1.3	178.0	
Rappahannock River (Upper)	55.5	37.1	221.8		2.1	1.3	211.1	
James River (Middle)	54.5	21.0	128.0		1.9	0.8	144.6	
Pamunkey River	3.6	2.5	230.8		0.1	0.1	222.5	
Mattaponi River	2.3	2.3	331.7		0.1	0.1	331.7	

[a] Area populations (number and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE G-6. VIRGINIA CANVASBACK POPULATIONS AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 11 YEAR PERIOD 1961-71

Survey area	Number				Percent			
	Mean	S.E.	C.V.	Slope[a]	Mean	S.E.	C.V.	Slope
Rappahannock River (Lower)	2248.6	628.4	92.7		30.2	8.1	88.5	
James River (Lower)	1458.8	483.5	109.9		16.7	6.4	128.2	
York River	1517.2	445.0	97.3		15.7	3.1	66.2	-2.5
James River (Middle)	1501.4	508.5	112.3		13.3	3.9	97.5	
Rappahannock River (Upper)	255.9	139.1	180.3		4.9	2.3	156.4	
Smith Pt. to Windmill Pt.	786.4	781.4	329.6		3.5	3.4	325.0	
Newport News to York River	502.3	333.4	220.2		3.3	1.6	162.0	
Mobjack Bay and Piankatank River	219.1	208.3	315.3		1.2	0.9	249.6	
James River (Upper)	141.8	135.9	317.7		0.8	0.8	318.1	
Fisherman's Island to Silver Beach	50.0	27.8	184.4		0.3	0.2	176.4	
Pamunkey River	12.7	9.4	246.2		0.1	0.1	227.0	
Mattaponi River	4.5	4.5	331.7		0.0	0.0	331.7	
Silver Beach to Saxis	2.3	2.3	331.7		0.0	0.0	331.7	
James River (Hog Island Refuge)	0.9	0.9	331.7		0.0	0.0	331.7	

[a] Area populations (number and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE G-7. VIRGINIA AMERICAN WIGEON POPULATIONS AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 11 YEAR PERIOD 1961-71

Survey area	Number				Percent			
	Mean	S.E.	C.V.	Slope[a]	Mean	S.E.	C.V.	Slope
James River (Lower)	561.1	166.7	98.6		21.0	8.0	125.7	
Silver Beach to Saxis	140.0	84.0	199.0		5.4	3.4	211.8	
Mobjack Bay and Piankatank River	34.1	17.9	174.5		4.7	4.0	283.2	
Fisherman's Island to Silver Beach	109.1	56.3	171.3		3.9	2.3	194.4	
Smith Pt. to Windmill Pt.	23.2	9.8	140.5		3.3	2.0	200.8	
York River	33.6	14.0	137.9		2.6	2.0	255.8	
Newport News to York River	22.3	10.6	157.9		1.3	0.6	149.2	
Pamunkey River	20.9	20.9	331.7		1.3	1.3	331.7	
James River (Presquile NWR)	14.1	7.7	182.2		0.9	0.6	220.1	
Rappahannock River (Lower)	10.0	4.2	139.6		0.6	0.5	264.2	
James River (Middle)	11.7	6.3	177.4		0.4	0.2	182.8	
James River (Upper)	10.9	10.9	331.7		0.2	0.2	331.7	
James River (Hog Island Refuge)	9.1	9.1	331.7		0.2	0.2	331.7	

[a] Area populations (number and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE G-8. VIRGINIA BLACK DUCK POPULATIONS AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 11 YEAR PERIOD 1961-71

	Number				Percent			
Survey area	Mean	S.E.	C.V.	Slope[a]	Mean	S.E.	C.V.	Slope
Pamunkey River	1801.8	438.1	80.6	-290.1	10.3	1.7	55.9	
Chickahominy River	1448.3	386.5	88.5		8.7	2.7	103.3	
James River (Presquile NWR)	1262.3	260.6	68.5		7.4	1.1	48.8	
Rappahannock River (Upper)	1275.0	294.4	76.6	-266.2	6.6	1.1	55.2	-0.9
James River (Lower)	1170.1	595.6	168.8	-385.7	5.5	2.2	133.0	-1.4
Fisherman's Island to Silver Beach	879.1	302.3	114.0		4.4	1.4	102.1	
Silver Beach to Saxis	651.8	151.7	77.2		3.5	0.8	77.0	
James River (Hog Island Refuge)	418.2	105.2	83.4		2.8	0.8	94.4	
York River	368.6	88.0	79.2		2.7	0.9	111.9	
James River (Upper)	410.0	89.5	72.4		2.4	0.4	59.8	
Rappahannock River (Lower)	280.0	81.8	97.0		2.4	0.9	127.1	0.7
Mattaponi River	238.2	51.5	71.7		1.6	0.5	94.8	
Mobjack Bay and Piankatank River	162.5	77.6	158.4		1.1	0.5	150.9	
Smith Pt. to Windmill Pt.	173.6	123.2	235.2		1.0	0.8	246.2	
Newport News to York River	165.5	52.3	104.8		1.0	0.2	80.6	
James River (Middle)	93.5	28.0	99.4		0.6	0.2	100.4	

[a] Area populations (number and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).

APPENDIX TABLE G-9. VIRGINIA MALLARD POPULATIONS AND PERCENT DISTRIBUTIONS BY SURVEY AREA DURING THE 11 YEAR PERIOD 1961-71

Survey area	Number				Percent			
	Mean	S.E.	C.V.	Slope[a]	Mean	S.E.	C.V.	Slope
Pamunkey River	1537.7	499.7	107.8		17.1	3.6	69.5	
James River (Presquile NWR)	1295.9	302.2	77.4		15.3	2.5	53.4	
Chickahominy River	1063.8	215.9	67.3		13.2	2.2	56.3	
Rappahannock River (Upper)	570.9	187.1	108.7	-151.0	6.4	1.9	97.4	-1.4
James River (Lower)	386.3	142.8	122.6		4.7	1.1	79.3	
James River (Upper)	327.3	70.0	70.9		4.4	1.0	77.2	
James River (Hog Island Refuge)	243.2	115.6	157.7		2.3	0.8	118.8	
York River	135.5	42.3	103.5		2.0	0.7	119.2	
Fisherman's Island to Silver Beach	161.4	63.6	130.7		1.7	0.6	112.8	
Mattaponi River	122.3	37.6	102.0		1.7	0.6	107.9	
Rappahannock River (Lower)	89.5	24.6	91.2	16.8	1.5	0.5	109.6	0.4
Silver Beach to Saxis	51.8	39.6	253.2		0.7	0.5	251.3	
Smith Pt. to Windmill Pt.	34.1	26.8	260.3		0.7	0.6	292.2	
James River (Middle)	51.4	23.7	152.8		0.6	0.3	171.8	
Newport News to York River	31.4	11.3	119.5		0.4	0.1	112.3	
Mobjack Bay and Piankatank River	4.1	2.8	224.2		0.1	0.0	224.8	

[a] Area populations (number and percent) were regressed against years. Slopes, which estimate rates of change per year, are shown if significant (0.05 level).